NASA SP-7011 (83)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA SP-7011 (83)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Scientific and Technical Information System during November, 1970.

Scientific and Technical Information Office
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. DECEMBER 1970

INTRODUCTION

Aerospace Medicine and Biology is a continuing bibliography which, by means of periodic supplements, serves as a current abstracting and announcement medium for references on this subject. The publication is compiled through the cooperative efforts of the American Institute of Aeronautics and Astronautics (AIAA) and NASA Scientific and Technical Information Facility. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals, and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, NASA SP-7011, which was published in July, 1964. Supplements are identified by the same number followed by two additional digits in parentheses.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry consists of a standard citation accompanied by its abstract in the following order:

a. NASA entries identified by their *STAR* accession numbers (N70-10000 series), and

b. AIAA entries identified by their *IAA* accession numbers (A70-10000 series).

The abstracts have been reproduced from those appearing in *STAR* and *IAA*. This procedure, adopted in the interests of economy and speed, has introduced some variation in size, style, and intensity of type.

AVAILABILITY OF DOCUMENTS

Availability of this Bibliography

Copies of *Aerospace Medicine and Biology* (NASA SP-7011) and its supplements are available to the public from the National Technical Information Service, Springfield, Virginia 22151, for $3 each. Copies are available on initial distribution without charge to the following:

1. NASA Offices, Centers, contractors, subcontractors, grantees, and consultants;
2. Other U.S. Government agencies and their contractors;
3. Libraries in the United States that have arrangements with NASA to maintain collections of NASA documents for public use;
4. Other organizations in the United States having a need for NASA documents in work related to the aerospace program; and
5. Foreign government or academic organizations that have established appropriate reciprocal arrangements with NASA.

STAR Entries

Availability of NASA Documents

NASA documents are identified by an asterisk following the accession number. NASA documents that have been microfiched (1) (identified by the # sign) are available on microfiche without charge to an organization eligible to receive *Aerospace Medicine and Biology* without charge.

Availability of Non-NASA Documents

Non-NASA documents are those documents that do not carry an asterisk in the citation. Department of Defense documents (identified by the "AD" number in the citation and indexes) are available, subject to a service charge, in hard copy or microfiche from the National Technical Information Service, Springfield, Virginia 22151. Microfiche copy of DOD reports are available to Defense Documentation Center users at no cost from the Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314. National Lending Library (NLL) for Science and Technology translations are available from NLL at the price stipulated in the citation. Requests for purchase should be addressed to:

National Lending Library for Science and Technology
Boston Spa, Yorkshire, England.

Dissertations selected from Dissertation Abstracts are available in xerographic copy and on microfilm for sale from University Microfilms, Inc., Ann Arbor, Michigan, 48106. All requests should cite the author and Order Number as they appear in the citation. Note that the dissertations are provided on microfilm and not microfiche.

Other non-NASA documents are publicly available as indicated in the citation. Those documents which have been microfiched are available on microfiche without charge only to NASA Offices, Centers, contractors, subcontractors, and consultants.

How to Obtain Microfiche

If you are registered with NASA and eligible to receive reports as described above, send the completed *Document Request* (Facility Form 492) to:

NASA Scientific and Technical Information Facility
P.O. Box 33
College Park, Maryland 20740

(1) A microfiche is a transparent sheet of film, 105 x 148 mm in size, capable of containing up to 72 pages of information reduced to micro images (not to exceed 20:1 reduction).

If you are not registered with NASA and wish to receive information concerning registration, request *Registration Form—Technical Publications* (Facility Form 713) from the NASA Scientific and Technical Information Facility at the address given above. Others may obtain microfiche copies by purchase from:

National Technical Information Service
(NTIS)
Springfield, Virginia 22151

U.S. Government Sales Agencies

Publications with a CFSTI availability statement in the citation are sold in hard copy and microfiche copy by:

National Technical Information Service
(NTIS)
Springfield, Virginia 22151

The following unit price has been established by NTIS: $3.00 for hard copy, $0.95 for microfiche.

Publications with a SOD availability statement in the citation are sold in hard copy by:

Superintendent of Documents, U.S. Government Printing Office (SOD)
Washington, D.C. 20402

NASA documents available from the SOD are also available from NTIS at the SOD price given in the citation.

NOTE: Documents announced without specific availability statement may be requested from the issuing activity.

Bibliographic information, e.g., report number, etc., rather than the NASA accession number (i.e., N70-12345), should be provided when requesting a document from other than NASA.

IAA Entries

All cited documents are available from the AIAA Technical Information Service as follows: Paper copies are available at $3.00 per document up to a maximum of 20 pages. The charge for each additional page is $0.25. Microfiche are available at the rate of $0.50 per microfiche for documents identified by the symbol # following the accession number. A number of publications, because of their special characteristics, are available only for reference in the AIAA Technical Information Service Library. Minimum air-mail postage to foreign countries is $1.00.

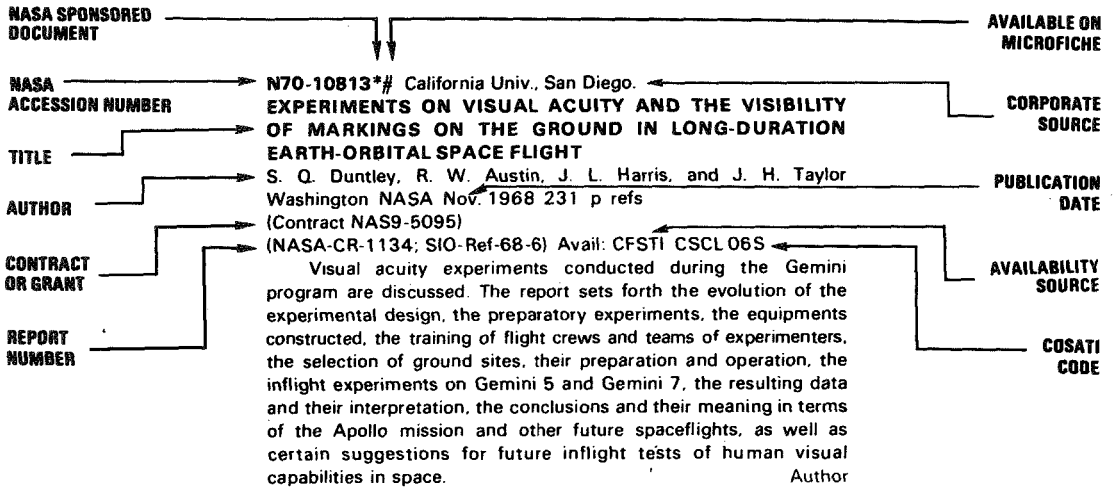
Please refer to the accession number, e.g., A70-13193, when requesting documents. Address all inquiries and requests to:

Technical Information Service
American Institute of Aeronautics and Astronautics, Inc.
750 Third Avenue, New York, N.Y. 10017

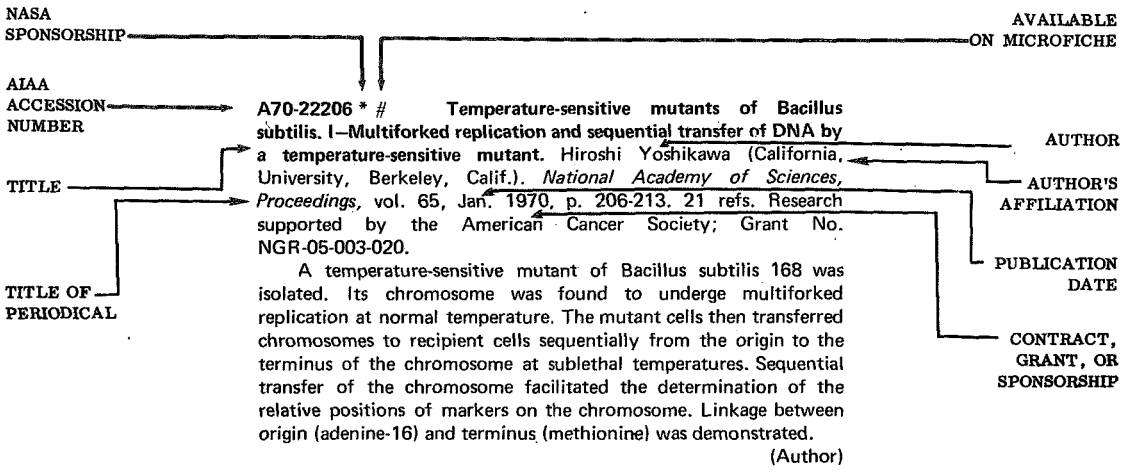
For further details please consult the *Introductions* to *STAR* and *IAA*, respectively.

TABLE OF CONTENTS

TYPICAL CITATION AND ABSTRACT FROM STAR



TYPICAL CITATION AND ABSTRACT FROM IAA



AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography DECEMBER 1970

STAR ENTRIES

N70-37609# Texas Christian Univ., Fort Worth. Inst. for the Study of Cognitive Systems.

SCHEMATIC CONCEPT FORMATION AS A FUNCTION OF STIMULUS DISPLAY AND MODE OF RESPONSE

Margaret A. Hastings and Selby H. Evans Feb. 1970 36 p refs

(Contract DAAD05-68-C-0176)

(AD-707368; HEL-TM-3-70) Avail: CFSTI CSCL 5/10

The purpose of the experiment was to determine the influence of both response mode and stimulus representation upon schematic concept formation. To realize this objective, response mode, stimulus display and stimulus presentation order were manipulated in a three-factor design. Author (TAB)

N70-37615# Air Force Systems Command, Wright-Patterson AFB, Ohio. Materials Lab.

FOAM-IN-PLACE FORM FITTING HELMET LINERS Technical Report, Jun. 1968 – Nov. 1969

Sidney Allinikov, John A. Ziegenhagen, and William H. Morton Apr. 1970 43 p

(AD-706402; AFML-TR-70-21) Avail: CFSTI CSCL 6/17

The feasibility of a foamed-in-place, form fitting foam helmet liner for Air Force crash or flying helmets was proven. Polyurethane foam helmet liners may be foamed-in-place directly on the flying crew members head, producing a perfectly fitting helmet liner with a minimum of time, labor, and inconvenience. A suitable polyurethane foam formulation was tailored to the specific requirements for the foam-in-place helmet liners. Design and fabrication of a suitable mold in which the helmet liner is foamed and which would be worn by the individual being fitted for a custom helmet liner during the foaming process, was accomplished. Author (TAB)

N70-37625# Sandia Corp., Albuquerque, N.Mex.

ELECTROSTATIC DEPOSITION DEVICE TO DEPOSIT MONOLAYERS OF BACTERIAL SPORES ON TEST SURFACES

Willis J. Whitfield [1970] 19 p Presented at 19th Ann. Tech. Meeting and Exhibit of the Am. Assoc. of Contamination Control, Anaheim, Calif. Sponsored by AEC

(SC-DC-70-4833; CONF-70049-1) Avail: CFSTI

A device was developed to deposit bacteria in monolayers on test surfaces. It was developed in an effort to eliminate clumps of bacteria which appear to provide some form of protection for bacteria during dry heat sterilization cycles. Experimental results using this device showed that clumped bacteria requires longer heating periods than do bacteria deposited as monolayers. This device, known as the electrostatic deposition device, aerosolizes suspensions of bacteria which are charged with a negative charge. The charged bacterial particles are attracted to positively charged test strips located on a rotating turntable. A potential of 30 to 40 kilovolts is used by the device to charge and deposit bacteria on the test strips. Standard stainless or aluminum test strips are used. Author

N70-37680# Air Force Systems Command, Brooks AFB, Tex. Human Resources Lab.

INNOVATIONS IN AIR FORCE TECHNICAL AND FLYING TRAINING

Horace H. Valverde Jun. 1970 31 p refs Presented at the Symp. on Evaluation of Educational Technol. Appl., Annapolis, 22–26 Jun. 1970

(AD-707511) Avail: CFSTI CSCL 5/9

Two innovations in technical and flying training are described. The first is an application of the systems approach to electronics maintenance training. The systems approach resulted in a fourteen-week course. The conventional course required twenty four weeks. Graduates of the two courses were compared on various criteria. The second effort pertains to the development and evaluation of audio/video recordings in undergraduate pilot training. Equipment mounted in the aircraft produced audio/video recordings that were of substantial help to the students when viewed after flight. Author (TAB)

N70-37685# Army Behavior and Systems Research Lab., Arlington, Va.

COMPARISON OF COMPUTER-SIMULATED CONVENTIONAL AND BRANCHING TESTS

Carrie W. Waters Mar. 1970 42 p refs

(AD-707375; BESRL-TRN-216) Avail: CFSTI CSCL 5/10

In the usual testing situation, each examinee takes all the items, and item sequence is the same for each examinee. It is possible, however, to have sequential or branching tests in which all examinees do not take te same items and the sequence of item presentation for an individual is some function of his performance on previous items; that is, an item answered correctly is followed by a more difficult item, an item answer incorrectly, by a less difficult item. The rationale for the latter procedure is that presentation of items based on an examinees past performance allows each individual to take items that are progressively more appropriate to his own level of ability. It is conceivable that such a procedure would reduce testing time, and for a given amount of time would permit more accurate measurement of an individuals

ability, principally by reducing opportunities for chance success by low ability examinees attempting items too difficult for them. Author (TAB)

N70-37714# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
ANTHROPOLOGICAL APPLICATIONS IN HIGH ALTITUDE FLIGHT SYSTEMS
Milton Alexander, John W. Garrett, and Joan C. Robinette Mar. 1970 19 p refs
(AD-706888; AMRL-TR-70-3) Avail: CFSTI CSCL 5/5

The report reflects research on various phases of the dimensional requirements of the pressure suited man in the man-machine system. The spatial requirements for the man in a cockpit or capsule and an ejection and escape mechanisms or wearing clothing as protection against hostile environmental factors, such as heat, cold, vacuum, high g, and radiation, present separate problems for the design engineer that can be helped effectively with the applicable anthropological data. Author (TAB)

N70-37718# Naval Aerospace Medical Inst., Pensacola, Fla.
PRELIMINARY REPORT ON A TEST OF MECHANICAL COMPREHENSION
John T. Evans (Boston Naval Hospital) Mar. 1970 10 p
(AD-707125; NAMI-1103; NAVMED-MF12-524-002-5001D) Avail: CFSTI CSCL 5/9

Discrepancies between mechanical comprehension test scores and later performance by aviators suggested that paper-pencil tests do not measure the type of mechanical comprehension required of the aviator. The problem was to devise a mechanical task that would include more of the specific elements required in the pilots job. Author (TAB)

N70-37722# Army Natick Labs., Mass. Food Lab.
FREEZE-DRYING OF FOODS FOR THE ARMED SERVICES
J. M. Tuomy Feb. 1970 53 p refs
(AD-706900; FL-107; TR-70-43-FL) Avail: CFSTI CSCL 6/8

The report reviews the development and use of freeze-dried food products for the Armed Services. It covers the various products and ration systems that have been developed, the basic parameters of freeze-drying and freeze-dried foods, commercial freeze-drying facilities, compression of freeze-dried foods, and development of freeze-dried foods for astronaut feeding. The report is non-technical and includes a selected bibliography for persons wishing to go more deeply into the technical aspects of freeze-drying. Author (TAB)

N70-37744# Coast Guard, Baltimore, Md. Field Testing and Development Center.
VISUAL SIGNAL EVALUATOR
Guy P. Clark 4 May 1970 33 p
(Contract DOT-CG-92450-A)
(AD-707187; USCG-509) Avail: CFSTI CSCL 6/2

The Visual Signal Evaluator (VISE) is a device designed and constructed by Bio Technology, Incorporated, Falls Church, Virginia. Through use of a beamsplitter in the field of view, an effective point source (signal) light is superimposed on that field of view. Controls allow for varying color, intensity, and flashing characteristics of the superimposed light. This report presents an evaluation of the VISE. Author (TAB)

N70-37808 Wisconsin Univ., Madison.
SYNTHESIS OF AN INTERACTIVE HUMAN-MACHINE SYSTEM
John James Lenahan (Ph.D. Thesis) 1969 216 p
Avail: Univ. Microfilms: HC $9.90/Microfilm $3.00 Order No. 69-12389

The design, analysis, and application are discussed for an interactive human-machine system that operates as a real-time control/time-sharing system. The system-state model, which is used to integrate design, analysis, and application is developed. The system-state model is stated initially in abstract terms using sets, then reformulated using principles of directed graphs, matrix notation, and information which describes the timing, processing and control within individual system components. Basic concepts that are introduced include system-state, system-state diagram, subsystem level, cycle time, function level, priority level, transition condition and transition time. Four basic matrices, defined as the transition, system-state control, system and system control matrices, provide the computational capability of the model. Together, the basic concepts plus the matrices form a quantitative, integrated construct for designing and evaluating a wide range of systems including both human-machine and machine-machine configurations. Dissert. Abstr.

N70-37857# Cornell Univ., Ithaca, N.Y.
STUDIES OF PHOTOSYNTHETIC ENERGY CONVERSION Annual Progress Report, 1 Sep. 1969 - 31 Aug. 1970
Roderick K. Clayton 31 Aug. 1970 7 p refs
(Contract AT(30-1)-3759)
(NYO-3759-17) Avail: CFSTI

Continuing studies and future plans in the biochemical research are briefly reported. The topics include the following: synthesis of electron transport systems associated with photosynthetic reaction centers; photochemical mechanism in reaction centers; photosystems in Rhodopseudomonas spheroides; membrane potentials; virology; reaction center purification; primary and secondary electron acceptors and donors in reaction centers; electron transport kinetics in reaction centers; and bacteriochlorophyll fluorescence yield in vivo. N.E.N.

N70-37893# Martin Marietta Corp., Orlando, Fla.
TARGET ACQUISITION STUDIES: VISUAL ANGLE REQUIREMENTS FOR TV DISPLAYED TARGETS Final Report, May 1969 - May 1970
James W. Bergert and Frank D. Fowler May 1970 74 p refs
(Contract N00014-67-C-0340)
(AD-706369; OR-10689) Avail: CFSTI CSCL 5/5

The objective of the study was to determine the smallest angle that an object viewed on a television display could subtend at the observers eye and be detected or recognized as a target. Tests were conducted using both static and dynamic modes to provide a data baseline for the dynamic conditions simulating aircraft flight. Television field-of-view, target-to-background contrast and target background areas were varied for the detection and recognition tasks at briefed target positions. A significant finding of this study related performance to introduction of the dynamic factor. Author (TAB)

N70-37923# Naval Medical Research Inst., Bethesda, Md.
THE EFFECT OF HYPERBARIC EXPOSURE ON SERUM CONSTITUENTS IN THE RAT: A PRELIMINARY STUDY
George M. Adams, Richard E. Danziger, Edgar M. Neptune, Jr., Terry L. Sallee, and David E. Uddin 14 May 1970 11 p refs
(AD-706740; NAVMED-M4306-02-4010B-1) Avail: CFSTI CSCL 6/19

Rats were exposed to 90 PSIG on an 80:20 helium-oxygen gas mixture and decompressed on two different schedules, designed to produce moderate and severe bends. Serum samples were

obtained immediately after the dive and analyzed for lipid distribution, serum lactic dehydrogenase, lipoproteins, haptoglobin, glucose, and lactate. The results of these determinations are discussed in relation to decompression sickness. Author (TAB)

N70-37928# University of Southern Calif., Los Angeles. Schools of Engineering and Medicine.
DEVELOPMENT OF A TRAINING PROGRAM FOR MEDICAL-ENGINEERING TEAMS
A. W. Siegel *In its* UCLA Motor Vehicle Safety Contract Sep. 1969 p 29-33 (See N70-37926 21-34)
Avail: Issuing Activity

Scope and objective of the training program seminar for medical-engineering teams covered theoretical, experimental, and real-world aspects of highway collision investigation and reconstruction. Emphasis was placed on occupant kinematics and assessment of design for injury reduction. Accident cause was studied in terms of environment, driver, and vehicle factors. Author

N70-37930# University of Southern Calif., Los Angeles. Schools of Engineering and Medicine.
THORACIC IMPACT: THE STATIC AND DYNAMIC BEHAVIOR OF THE HUMAN THORACIC SKELETON
S. B. Roberts *In its* UCLA Motor Vehicle Safety Contract Sep. 1969 p 283-302 (See N70-37926 21-34)
Avail: Issuing Activity

The effort during the past year has been focused upon obtaining a predictive capability for the elastostatic behavior of the thoracic skeleton. A comprehensive static analysis capability is deemed to be an important preliminary step toward the construction of a dynamic analysis. Specifically this entails the development of the necessary analytic tools (in the form of a finite element computer program), the material, and geometric properties of the system as well as meaningful loading conditions. Some rib stiffness data has been experimentally obtained, and a preliminary Thorax I structural model has been constructed and computer analyses have been conducted. Author

N70-37931# University of Southern Calif., Los Angeles. Schools of Engineering and Medicine.
CARDIOVASCULAR IMPACT: AORTA RUPTURE
R. Collins *In its* UCLA Motor Vehicle Safety Contract Sep. 1969 p 303-342 refs (See N70-37926 21-34)
Avail: Issuing Activity

Origin and magnitude of forces necessary to rupture the aorta in automobile accidents were studied by the following supporting analyses: (1) stress measurements in the viscera between the thorax and the cardiovascular region; (2) impulse flow dynamics in glass models of curved vessels; (3) *'in vitro'* tensile dynamics of human aorta at different loading or strain rates; and (4) *'in situ'* tensile tests of aorta wall tissue under dynamic loading to obtain information for empirical estimates of rupture strength of aorta walls. A numerical method of characteristics was used to evaluate equations of motions for the fluid and stress-strain relationships in aorta rupture mechanics. G.G.

N70-37932# University of Southern Calif., Los Angeles. Schools of Engineering and Medicine.
MECHANICAL CHARACTERIZATION OF HUMAN TISSUE
R. A. Westmann *In its* UCLA Motor Vehicle Safety Contract Sep. 1969 p 343-371 refs (See N70-37926 21-34)
Avail: Issuing Activity

Primary effort has been directed toward the basic fracture properties of human bone. Analytical, experimental and histological studies of bone material have been performed and the results of these may be summarized as follows: (1) based on the data available, it appears that modern fracture mechanics provides an appropriate theory for examining the fracture properties of human bone; (2) a typical value for the fracture toughness or critical crack tip stress intensity factor for human humerus bone is about 3,100 psi per sq root inch; and (3) there appears to be little difference between the fracture properties of embalmed and fresh (seven day) human humeri. Author

N70-37933# University of Southern Calif., Los Angeles. Schools of Engineering and Medicine.
HEAD INJURY
S. B. Roberts *In its* UCLA Motor Vehicle Safety Contract Sep. 1969 p 373-417 refs (See N70-37926 21-34)
Avail: Issuing Activity

The series of analytic studies reported was designed primarily to: (1) determine the feasibility of mathematically modeling the blunt trauma head problem; (2) to determine response sensitivity to selected variations in stiffnesses and applied forces; and (3) to establish guidelines for future experimental efforts. The results indicate that it is possible to employ relatively simple dynamic mathematical models of the human, and predict gross response of the major anatomical elements. Conclusions on response in the head-neck region are: (1) the motion of the forearms and upper arms does not significantly influence the kinematics or deformation in the head-neck region; (2) the head-neck response is quite sensitive to the location of the applied forcing function; (3) there is a clear response dependence upon the neck translational and rotational stiffness; and (4) the shape of the applied force-time history, in particular the initial slope or rise time, affects response. Author

N70-37934# University of Southern Calif., Los Angeles. Schools of Engineering and Medicine.
NEUROLOGIC STUDIES
A. M. Nahum *In its* UCLA Motor Vehicle Safety Contract Sep. 1969 p 419-421 (See N70-37926 21-34)
Avail: Issuing Activity

Reported are a series of impact tests on primates implanted stereotaxially with neurophysiological recording devices and trained for baseline behavioral tasks. Accurate reproductible data of the impact event were obtained and baseline blood values were established. G.G.

N70-37964# Washington Univ., St. Louis, Mo.
THE EFFECT OF FATIGUE ON VISUAL SEARCH ACTIVITY IN HELICOPTER PILOTS Annual Summary Report, 1969 - 1970
John A. Stern 1970 49 p ref
(Contract DA-49-193-MD-27)
(AD-706239; ASR-1) Avail: CFSTI CSCL 6/16

The major efforts were focused (a) on extending the manual data analysis to portions of the flight not previously evaluated (during take-off and during landing); (b) the development of computer programs to allow for the more efficient and reliable reduction of such data; and (c) the development of computer programs to allow for data reduction and representation otherwise not feasible. Author (TAB)

N70-37984# Vermont Univ., Burlington. Dept. of Psychology.
EKG CHANGES FROM PRE- TO POST-TIME ESTIMATION PERIOD ACROSS MULTIPLE SENSORY DEPRIVATION TRIALS Interim Report
Gary Mc Clure and Donald G. Forgays Mar. 1970 12 p refs
(Contract F44620-69-C-0001; Proj. THEMIS)

(AD-706380; AFOSR-70-1412TR; TR-5) Avail: CFSTI CSCL 6/16

The report summarizes data taken from four subjects exposed to multiple sensory deprivation runs. The water-immersion technique of isolation was employed and the subject run for three trials, spending an average of nearly seven hours per trial. Continuous EKG data obtained on each run was partitioned into 5% portions of total run and a constant part of these portions was compared. While earlier analyses had indicated a pattern of decreasing EKG across trials, the present more sensitive analysis shows the importance of an individual difference analysis. Author (TAB)

N70-37985# Vermont Univ., Burlington. Dept. of Psychology.
AROUSAL AND REPEATED ISOLATION EXPERIENCES Interim Report
Gary Mc Clure and Donald G. Forgays Mar. 1970 11 p refs
(Contract F44620-69-C-0001; Proj. THEMIS)
(AD-706379; AFOSR-70-1411TR; TR-4) Avail: CFSTI CSCL 5/10

The report presents the results of four male adult subjects exposed to sensory isolation through water-immersion for three trials totaling about 20 hours. The results presented are EKG frequencies taken before and after time-estimation hacks throughout the runs. EKG frequency taken before time hacks showed a decrease across trials; that taken after time hacks displayed a rather steady picture. These results were viewed as evidence for the notion that stress arousal may be ameliorated with experience while arousability may remain at the same level. Author (TAB)

N70-38022# Naval Aerospace Medical Inst., Pensacola, Fla.
VISUAL DISTORTION: A POINT OF VIEW
Robert S. Kennedy 6 Jan. 1970 34 p refs *Its* Monograph No. 15
(AD-707064) Avail: CFSTI CSCL 6/16

The first part of the paper is an overview of the visual distortion literature, with a discussion of its role in the study of perceptual development. The second part offers a framework in which to view the effects of visual distortion. In addition, a possible mechanism for the explanation of the disturbing effects which result, and the subsequent adaptation to them, is suggested. The description of the mechanism is molar, although speculations about anatomical locus and neuronal components are included. Author (TAB)

N70-38039# Naval Medical Field Research, Camp Le Jeune, N.C.
EVALUATION OF A PROTOTYPE UNIT FOR TELEMETRY OF RECTAL TEMPERATURES
Wade G. Holcomb and Philip J. Rasch Apr. 1970 19 p refs *Its* Vol. 20, No. 5
(AD-706329) Avail: CFSTI CSCL 6/2

Studies were conducted to determine whether pulsed tone burst (A2 emission) would provide acceptable data during the telemetering of body core temperatures under actual field conditions. It was determined that it provided usable temperature data at ranges up to 1,000 yards in hilly terrain and up to 600 yards in dense scrub. Author (TAB)

N70-38049# Pennsylvania Univ., Philadelphia.
NON-THERMAL EFFECTS OF ALTERNATING ELECTRICAL FIELDS ON BIOLOGICAL STRUCTURES Final Report, 1 Mar. 1964–31 Dec. 1969
Herman P. Schwan 30 Apr. 1970 10 p
(Contract Nonr-551(52))
(AD-706772) Avail: CFSTI CSCL 6/3

A summary is given of a research program involving the following phases: The feasibility of rapidly freezing and thawing blood; The dielectric properties of hemoglobin bound water; Electrical properties of erythrocytes; Field induced force effects and their biological significance; Survey of biohazards and related biophysics. A list of the 59 publications resulting from the work is included. TAB

N70-38083# Princeton Univ., N.J. Psychology Lab.
ELECTRONIC COMPUTER PROGRAMS: GENERAL DESCRIPTION
Harold Gulliksen May 1970 5 p Prepared in cooperation with Educational Testing Service
(Contract N00014-67-A-0151-0006; Grants NSF GJ-34; NSF GU-3157)
(AD-707437) Avail: CFSTI CSCL 5/10

Five programs for scaling and two for parameter estimation and learning curves that have been developed in connection with a project on mathematical techniques in psychology are described briefly. TAB

N70-38088# Massachusetts General Hospital, Boston. Stanley Cobb Labs. for Psychiatric Research.
THE EFFECTS OF SENSORY DEPRIVATION AND VARIED SENSORY INPUT ON ELECTROPHYSIOLOGIC AND METABOLIC ACTIVITIES ON THE CENTRAL NERVOUS SYSTEM Final Technical Report, 19 Feb. 1959–29 Feb. 1968
Frank R. Ervin and Jack H. Mendelson 30 Jun. 1969 198 p
(Contract Nonr-1866(41))
(AD-707174) Avail: CFSTI CSCL 6/19

A final report is made for nine years of work done under contract. Advances in the study of sensory deprivation are considered and the direction of experiments within the larger field are outlined. Current work in progress is discussed in three detailed reports. The first examines the neuroanatomy of visual centers within the brain linked to a non-functioning eye. In the second report a method of characterizing the maturity of a layered neural structure was derived from cell population counts in normal rat superior colliculus. The third report updates earlier descriptions of an approach to biological unit counting through computerized scanning procedures. Author (TAB)

N70-38129# Toronto Univ. (Ontario). Inst. for Aerospace Research.
FLIGHT TRANSPORTATION
In its [Inst. for Aerospace Res.] Nov. 1969 p 113–115 (See N70-38116 21-01)
Avail: CFSTI

Summaries of research of Canadian air transportation are presented. Topics discussed include measurement of human pilot performance for tracking, and a study of short haul air transportation. F.O.S.

N70-38159*# Sandia Corp., Albuquerque, N. Mex. Planetary Quarantine Dept.
THE REVERSIBLE INHIBITION OF SPORE GERMINATION BY ALCOHOLS
Ralph Trujillo and Nancy Laible Aug. 1970 13 p refs Submitted for publication
(NASA Order W-12853)
(NASA-CR-112964; SC-DC-70-4937) Avail: CFSTI CSCL 06M

Low levels of alcohols were found to inhibit the process of spore germination. The extent of germination is dependent upon the concentration of alcohol present in the germinating medium.

This inhibition is reversible since removal of the alcohol from the spore environment allows germination to proceed. Author

N70-38161# George Washington Univ., Alexandria, Va. Human Resources Research Office.
DETERMINATION OF SELECTED COSTS OF FLIGHT AND SYNTHETIC FLIGHT TRAINING
Oran B. Jolley and Paul W. Caro, Jr. Apr. 1970 45 p refs
(Contract DAHC19-70-C-0012)
(AD-706764; HumRRO-TR-70-6) Avail: CFSTI CSCL 5/9

As part of an analysis of the value of synthetic training at the U.S. Army Aviation School, costs associated with the conduct of flight and synthetic training in the instrument phase of the Armys Officer/Warrant Officer Rotary Wing Aviator Course were identified and computed separately for each type of training. It was found that, for the factors considered, the hourly cost of flight training at the time of this study (September 1966) was approximately six times as great as the corresponding cost of synthetic flight training. The report describes the sources for and the treatment of data, and the major assumptions made in allocating the costs. Author (TAB)

N70-38205# Texas Christian Univ., Fort Worth. Inst. for the Study of Cognitive Systems.
THE SELECTION OF LOCAL FEATURES FOR PATTERN IDENTIFICATION: AN EXPLORATORY STUDY
D. W. Hastings and Selby H. Evans Aberdeen Proving Ground, Md. HEL Mar. 1970 25 p refs
(Contract DAAD05-68-C-0176)
(AD-707370; HEL-TM-5-70) Avail: CFSTI CSCL 5/10

A feature analytic process is proposed as a basic mechanism in the encoding and storage of visual shapes by humans. It is hypothesized that local features, encoded as feature prototypes plus deviations, are stored in memory according to their positional relationships in the pattern. Two studies explored methodologies for the study of feature selection and attempted to determine if humans would agree in their selection of features. Inspection of the results showed that humans do agree in their selection of features and tend to repeat the selection of similar visual configurations as features across patterns. It is proposed that the consistency of feature selection, both within and between patterns, is a function of both the informational properties of the feature and the population of features present in the patterns. Author (TAB)

N70-38209# Texas Christian Univ., Fort Worth. Inst. for the Study of Cognitive Systems.
FURTHER APPLICATIONS OF THE RANDOM ADAPTIVE MODULE (RAM) SYSTEM TO SCHEMA THEORY
Bill R. Brown and Selby H. Evans Aberdeen Proving Ground, Md. HEL Mar. 1970 41 p refs
(Contract DAAD05-68-C-0176)
(AD-707369; HEL-TM-4-70) Avail: CFSTI CSCL 5/10

The purpose of this investigation was the further development and assessment of a model for schematic concept formation. A computer simulation of the model, extended to include a higher-order pattern-representation unit, was used to make quantitative predictions of human performance in two mixed-schemata discrimination tasks. The simulations successfully predicted both the gross and detailed characteristics of human schematic concept formation. These results thus support the suggestion that the Random Adaptive Modules basic components may be useful in constructing models for performance in a variety of tasks related to schema theory. Author (TAB)

N70-38220# Naval Submarine Medical Center, Groton, Conn
TENTATIVE AUDIOMETRIC HEARING THRESHOLD LEVEL STANDARDS FROM 8 THROUGH 18 KILOHERTZ Interim Report
J. Donald Harris and Cecil K. Myers 11 Feb. 1970 8 p refs
(AD-706324; SMRL-MR-70-2; Rept-9) Avail: CFSTI CSCL 6/16

Both ears of 100 young healthy candidates for Submarine Service, aged 17-23 years, normal by otoscopy but otherwise unselected, were given Bekesy-type audiometry through 18 kiloHertz. Minimum audible pressures in the ear canal were obtained comparable to those from a published study on adolescent males; there is also correspondence with the British 1954 Standard for young adults up to 15 kiloHertz. It is suggested that the time is approaching for International Standardizing of audiometry in the octave 10-20 kiloHertz using all available data. Author (TAB)

N70-38238# St. Louis Univ., Mo. Dept. of Biology.
DESIGN CONSIDERATIONS IN THE DEVELOPMENT OF AUTOMATIC EQUIPMENT TO SUBJECT SUSPENSION CELL CULTURES TO REPETITIVE HYPOXIC SHOCK
David W. Rooney 1 May 1970 9 p refs
(Contract N00014-69-A-0206-0001)
(AD-707090; TR-1) Avail: CFSTI CSCL 6/3

Described are 6 criteria which must be met in the design of equipment for applying intermittent hypoxia to suspension cell cultures. Also described is a programmed manifold system which was designed and built to meet the 6 criteria. Author (TAB)

N70-38291*# Sandia Corp., Albuquerque, N. Mex. Planetary Quarantine Dept.
MICROBIAL STERILIZATION IN ULTRA-HIGH VACUUM AND OUTER SPACE: A KINETIC COMPARISON
J. P. Brannen Aug. 1970 5 p refs Submitted for publication
NASA Order W-12853)
(NASA-CR-112963) Avail: CFSTI CSCL 06M

The absolute reaction rate theory is used to establish a correlation between microbial die off in ultrahigh vacuum and outer space. Thermodynamic formulation is described for the case of microorganisms being sterilized by a first order chemical reaction. The results indicate that, from a kinetic viewpoint, D values obtained under ultrahigh vacuum (10 to the minus 6th power torr) are not appreciably different from those obtained under the pressure of outer space (10 to the minus 17th power torr). D.L.G.

N70-38292*# Sandia Corp., Albuquerque, N. Mex. Planetary Quarantine Dept.
AN ANALYSIS OF VACUUM EFFECTS IN THE STERILIZATION OF MICROORGANISMS
J. P. Brannen Aug. 1970 11 p refs Submitted for publication
(NASA Order W-12853)
(NASA-CR-112962) Avail: CFSTI CSCL 06M

By using the thermodynamic formulation of the absolute reaction-rate theory, variations in pressure can be incorporated in a rational model for dry-heat sterilization of microorganisms. Coupling this model to observations, a value for the volume change, as the reactant goes into the activated state, of 15 to 65 liters/mole is estimated for the sterilizing reaction. The theoretical volume change for DNA is about 7 liters/mole. Author

N70-38293*# Informatics Tisco, Inc., College Park, Md.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Washington NASA Jul. 1970 106 p refs Sponsored by NASA

(NASA-SP-7011(78)) Avail: CFSTI CSCL 06E

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N70-38302# Adaptronics, Inc., McLean, Va.
LARGE NEUROTRON NETWORKS Final Technical Report, 1 May 1968 - 30 Apr. 1969
Lewey O. Gilstrap, Jr. Wright-Patterson AFB, Ohio AMRL Mar. 1970 46 p refs
(Contract F33615-68-C-1395)
(AD-706855; AMRL-TR-69-92) Avail: CFSTI CSCL 6/4

Studies of neuromime network systems are presented. These studies include a prelogical exploration of goal-directed behavior to find a possible starting point for the development of a theory of such systems. Closed-loop behavior in neuromime nets is examined using a pulse-density model of a neuron. Several very simple closed-loop problems are analyzed using the technique and some rules established for analyzing more complex problems. Mechanization of neuromime nets using multiplexed neuromimes to give the effect of a large number of neuromimes is investigated for the case of spatially distributed pulse density codes, such as those that are provided by the retina of the eye. Author (TAB)

N70-38309*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DISCUSSION OF MANUAL CONTROL PROBLEMS
James H. Golmon 27 Dec. 1968 33 p refs
(NASA-TM-X-53906; IN-AERO-68-7) Avail: CFSTI CSCL 05H

Compensatory and pursuit tracking systems are discussed in relation to operator tasks. Motor coordination is analyzed using a muscle and nerve model. Mental tracking processes are mentioned along with eye and hand responses. Human operator characteristics are affected directly by the forcing function, manipulator dynamics, and controlled element dynamics. Other factors affecting the operator indirectly are environmental variables such as illumination and temperature, training, fatigue, and motivation. Quasilinear models of human operators are given for adaptation and optimization. The time delay term results from nerve conduction, human sensor excitation, computational lags, and other data processing activity in the central nervous system. The neuromuscular lag varies with task. The equalization characteristic and gain are the major elements in the human transfer function which allow the operator to stabilize differing dynamic devices. Problems with the quasilinear model include operator; response time, extrapolation compensation, behavior as a discrete or sampling system, and discontinuous behavior. Simulation studies on the feasibility of using astronauts in the attitude control loop during Saturn 5 propelled phases are cited. J.M.

N70-38319*# Translation Consultants, Ltd., Arlington, Va.
BIOCHEMICAL EVOLUTION OF ENZYME SYSTEMS AS A BASIS OF THE FUNCTIONAL EVOLUTION OF VERTEBRATES [BIOKHIMICHESKAYA EVOLYUTSIYA FERMENTNYKH SISTEM KAK OSNOVA FUNKTSIONALNOY EVOLYUTSII POZVONOCHNYKH ZHIVOTNYKH]
N. A. Verzhbinskaya Washington NASA Sep. 1970 20 p refs Transl. into ENGLISH from the publ. 'Aiogenez i Nachalnyye Stadii Evolyutsii Zhizni' Moscow, Nauka Press, 1968 p 169-180
(Contract NASw-2038)
(NASA-TT-F-13194) Avail: CFSTI CSCL 06C

The biochemical development of the acetylcholine system as the basis for the development of the synaptic, mediatory function in various classes of vertebrates is traced. The role of acetylcholinesterase is discussed. Author

N70-38339# City Coll. of the City of New York. Dept. of Physics.
TOWARD FORMULATION OF CRITERIA FOR IMAGE ENHANCEMENT, PART 2 Final Report, Mar. 1969 - Feb. 1970
Leo Levi Feb. 1970 185 p refs
(Contract N00014-69-C-0370)
(AD-706413) Avail: CFSTI CSCL 6/16

The investigation was aimed at establishing criteria for evaluating image enhancement techniques. The degree of enhancement was evaluated in terms of the amount of information (in the colloquial sense) transferred to the final detector. Special attention was given to those systems in which the human visual system is the final detector. The investigation was divided into three areas: (1) The establishment of abstract criteria for enhancement and the formulation of expressions for the optimum under given restrictions; (2) Application of these results to practical enhancement techniques - finding the expression for optimization for each one; (3) Formulating the performance of the human visual system in communication-theoretic terms and finding the values of the relevant parameters to permit the application of the results of Area (2) to systems involving visual detection. Author (TAB)

N70-38350# Princeton Univ., N.J.
THE COUNTBACK METHOD FOR ANALYZING SENSITIVITY DATA
Charles Lewis (Ph.D. Thesis) May 1970 101 p refs Prepared in cooperation with Educational Testing Service
(Contract N00014-67-A-0151-0006; Grant NSF GB-3402)
(AD-707355; RB-70-30) Avail: CFSTI CSCL 5/10

Sensitivity data are defined as involving two response categories, with responses observed at different levels of some variable of interest. The responses are taken to indicate sensitivity to the variable, and, in this regard, may be labeled positive and negative. Of particular interest in analyzing sensitivity data is the estimation of the 50% point, the level of the variable for which the two responses are equally likely. Author (TAB)

N70-38373*# Translation Consultants, Ltd., Arlington, Va.
CHEMICAL ECOLOGY [GEOKHIMICHESKAYA EKOLOGIYA]
V. V. Kovalskiy Washington NASA Sep. 1970 16 p refs Transl. into ENGLISH from the publ. 'Aiogenez i Nachalnyye Stadii Evolyutsii Zhizni' Moscow, Nauka Press, 1968 p 188-197
(Contract NASw-2038)
(NASA-TT-F-13196) Avail: CFSTI CSCL 06F

The biogeochemical classification of plants and animals into zones and provinces on the basis of the various chemical elements in the soil and the ability of living matter to accumulate and synthesize these elements is discussed. Author

N70-38375# Vermont Univ., Burlington. Dept. of Psychology.
ISOLATION RESEARCH AND MOTIVATION THEORY
Donald G. Forgays Mar. 1970 26 p Presented to the Symp. on Arousal and Motivation Theory, Burlington, Vt., 8 Sep. 1969
(Contract F44620-69-C-0001)
(AD-706378; AFOSR-70-1410TR; TR-2) Avail: CFSTI CSCL 5/10

The report summarizes the early research of the Isolation Laboratory at the University of Vermont. Two forms of isolation experiences were studied, sound-proofed room exposure and

under-water immersion. Results indicate that some subjects are able to tolerate the stresses of isolation much more than others and that these differences can be related to other behavioral and physiological factors. The relation of isolation research to general motivation theory is discussed. Author (TAB)

N70-38383*# Translation Consultants, Ltd., Arlington, Va.
COMPARATIVE BIOCHEMICAL STUDY OF MUSCLES [SRAVNITELNO-BIOKHIMICHESKOYE IZUCHENIYE MYSHTS]
I. I. Ivanov Washington NASA Sep. 1970 11 p Transl. into ENGLISH from the book 'Abiogenez i Nachalnyye Stadii Evolyutsii Zhizni' Moscow, Nauka Press, 1968 p 181–187
(Contract NASw-2038)
(NASA-TT-F-13195) Avail: CFSTI CSCL 06P

A study of adenosine triphosphate effects on muscle contractile systems is presented. Both live and macerated muscle fiber extractions were studied. The effect of ATP on calcium ion concentration was also investigated. Author

N70-38456# Human Engineering Labs., Aberdeen Proving Ground, Md.
US ARMY PRIMARY HELICOPTER SCHOOL: TRAINING PROGRAM PERFORMANCE NORMS
John A. Barnes and Flavous D. Statham Apr. 1970 90 p refs
(AD-707372; HEL-TM-8-70) Avail: CFSTI CSCL 5/9

The helicopter pilot training program of the Army differs from those of the other services in concept; it takes nonpilot servicemen and trains them to fly helicopters. The study provides normative performance data for a pilot trainee in an Army light observation helicopter as a first step toward establishing normative data for pilot performance in all Army helicopters. Author (TAB)

N70-38457# Human Engineering Labs., Aberdeen Proving Ground, Md.
EXPLORATORY STUDY OF PILOT PERFORMANCE DURING HIGH AMBIENT TEMPERATURES/HUMIDITY
Stephen Moreland and John A. Barnes Mar. 1970 88 p refs
(AD-707371; HEL-TM-6-70) Avail: CFSTI CSCL 6/19

The purpose of the study was to measure performance changes which may occur when Army personnel, wearing complete operational/combat flight clothing and equipment, fly a light observation helicopter during periods of high ambient temperature and humidity. Important relationships were found between physiological changes and crew station environment. An equation was developed to quantify a hypothetical relationship between performance, environment and physiological changes. Author (TAB)

N70-38460# Sperry Rand Corp., Great Neck, N.Y. Sperry Gyroscope Div.
VISUAL REQUIREMENTS STUDY FOR HEAD-UP DISPLAYS Final Report, Apr. 1966 – Mar. 1970
Theodore Gold and Aaron Hyman Mar. 1970 79 p refs
(Contract N00014-66-C-0114)
(AD-707128; SGD-4283-0333; JANAIR-680712) Avail: CFSTI CSCL 5/8

An experimental study was conducted to determine critical values of the essential optical and electronic design parameters for head-up displays based on the visual requirements of the pilots who will use these displays. This information will provide a basis for future specifications covering this type of display. The investigation covered two areas, size of exit pupil and binocular disparities due to optical distortions. The exit pupil study was conducted in a flight simulator in which a wide field (25 degrees) head-up display with a large aerial exit pupil was installed. Four pilots with military flight experience served as test subjects. The results indicate that the minimum size of exit pupil required is three inches in diameter, for wide-field systems in which the pilots head position is no more than 10 inches behind the exit pupil. Author (TAB)

N70-38473# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
THE ANTHROPOLOGY OF ANTHROPOMORPHIC DUMMIES
H. T. E. Hertzberg 1970 24 p refs Presented at the 13th Stapp Car Crash Conf., Boston, 2–4 Dec. 1969 Submitted for publication
(AD-706411; AMRL-TR-69-61) Avail: CFSTI CSCL 5/5

The paper describes anthropological aspects of a cooperative program to create a family of anthropomorphic dummies representative of the American population. The dummies are for use in crash-tests to improve public safety in motor vehicles. The anthropomorphic dummy is that type which closely approximates a given percentile level of the human body in size, form, segment mobility, total weight, segment weight, weight distribution and resiliency of its flesh covering, and is usually able to withstand 100G. The history of this development is briefly sketched from its beginning in 1949. In the current program, the best available data have been chosen for three adult sizes: the 95th- and 50th-percentile males, and the 5th-percentile female. The body-forms being sculptured will provide a set of national standards for size, shape and weight. Future phases will involve the development of dummy organ-masses approximating the sizes and vibratory responses of those in the living torso. Deficiencies of the anatomical, anthropometric, biomechanical and physiological data used for these body-forms are noted, and suggestions are made for improvement, so that future dummies may be made more reliably representative of the using population. Author (TAB)

N70-38497# North Dakota Univ., Grand Forks.
PROJECT THEMIS Annual Progress Report, 15 Jul. 1969 – 14 Jul. 1970
Russell H. Wilson and Francis R. O'Brien 1 May 1970 275 p refs
(Contract N00014-68-A-0499)
(AD-707449) Avail: CFSTI CSCL 8/1

A computer-controlled deep sea simulator is being designed to study ocean environmental effects on mammalian learning, memory, behavior, physiology, and biochemistry. An engineering and physiologic approach will be made to solve problems of biologic systems under environmental extremes. TAB

N70-38501*# Lockheed Missiles and Space Co., Palo Alto, Calif.
TRACE CONTAMINANT ADSORPTION AND SORBENT REGENERATION
A. J. Robell, C. R. Arnold, A. Wheeler, G. J. Kersels, and R. P. Merrill Washington NASA Sep. 1970 290 p refs
(Contract NAS1-5847)
(NASA-CR-1582; LMSC-L-62-69-1) Avail: CFSTI CSCL 06K

The adsorption and desorption characteristics of activated carbon were experimentally and theoretically investigated in order to determine the applicability of regenerable sorption to the control of airborne trace contaminants within spacecraft cabins for long mission durations. Capacity correlations for pure and mixed contaminants were established. A theory was derived and successfully tested for vacuum desorption rates from single particles and beds. A quantitative design methodology was developed for the practical design of regenerable systems. Author

N70-38527# *Bureau of Mines, Pittsburgh, Pa. Safety Research Center.*

EVALUATION OF CHEMICAL-CARTRIDGE RESPIRATOR FACE FIT

Harold A. Watson, Patricia M. Gussey, and Albert J. Beckert Sep. 1970 11 p refs

(BM-RI-7431) Avail: Issuing Activity

A method for measuring leakage of vapors into a chemical-cartridge half-mask facepiece during simulated use is described. The respirator, fitted with high-efficiency cartridges, is worn in a dichlorodifluoromethane air test mixture while a series of timed activities (facial movements, varied breathing, exercise, etc.) is performed. Complementing other tightness tests, this method is useful particularly for studying face fit and the effect of facial movements on leakage. The concentration of CCl2F- within the facepiece is monitored continuously to observe the immediate effect of physical activity on leakage. A composite sample is collected simultaneously in a plastic bag as a measure of average leakage during the 18-minute test period. Leakage, reported as percent, is calculated from the concentrations of CCl2F2 within the facepiece and in the test atmosphere. Author

N70-38530# Advisory Group for Aerospace Research and Development, Paris (France).

A NON-INVASIVE TECHNIQUE OF CARDIO-PULMONARY ASSESSMENT. PART 2: ILLUSTRATIONS

D. M. Denison Aug. 1970 62 p

(AGARD-AG-143-70-Pt-2) Avail: CFSTI

This collection of graphs and illustrations depicts the various measurements performed for cardiographic pulmonary assessment to human subjects. The relationship between oxygen uptake and local oxygen pressure is explored in gas tension measurements of core, muscle, and mixed venous bloods on subjects in supine position and subjected to certain exercises. G.G.

N70-38531# Advisory Group for Aerospace Research and Development, Paris (France).

A NON-INVASIVE TECHNIQUE OF CARDIO-PULMONARY ASSESSMENT. PART 1: TEXT

D. M. Denison Aug. 1970 58 p refs

(AGARD-AG-143-70-Pt-1) Avail: CFSTI

The Cardio respiratory function is examined primarily in connection with a particular non-invasive test of this function. It describes a theoretical explanation of factors influencing gas tensions in mixed venous blood and their measurement together with the effects of various cardio pulmonary stresses. There is also a review of the work done in this field during the past two years. Author

N70-38556# Joint Publications Research Service, New York.

ARTIFICIAL AND SYNTHETIC FOODS

A. Nesmeyanov 28 Aug. 1970 10 p Transl. into ENGLISH from Nauka i Zhizn (USSR), No. 6, 1970 p 29-32

(JPRS-51260) Avail: CFSTI

Finding quickly usable sources of food, primarily protein, for the increasing world population is discussed as the task of biologists, agriculturalists, and chemists. It is shown that the losses of protein in meat animal husbandry approximate 90%, and the elimination of the middle link, i.e. the animal, is desirable. The protein content of various foods are analyzed in terms of a balanced diet. Yeast proteins currently used in animal husbandry are suggested as a protein for human consumption. The problem of developing a flavorable and tasty dish is not considered as difficult as creating appetizing odors. A suggested simple method of using yeast protein is its addition to structureless foods such as flour and similar products. F.O.S.

N70-38567# Joint Publications Research Service, Washington, D.C.

EXPERIENCE OF INVESTIGATING THE MECHANISM OF THE EFFECT OF HYPOXIA ON ERYTHROPOIESIS

Ya. G. Uzhanskiy 8 Sep. 1970 8 p refs Transl. into ENGLISH from *Patol. Fiziol. Eksp. Ter. (Moscow)*, v. 15, no. 3, May-Jun. 1970 p 3-8

(JPRS-51327) Avail: CFSTI

It was demonstrated that a low partial oxygen pressure diminishes the mitotic activity of erythroblasts in bone marrow tissue cultures. The assumption that there may be a change in type of bone marrow metabolism, from oxidative to glycolytic in the presence of increased regeneration of blood was also ruled out by direct experiments. In addition, investigations involving the use of a micromethod for assaying gases in blood of animals following blood-letting revealed that in the presence of increased erythropoiesis a rather high oxygen content is maintained in bone marrow. Analogous findings were made on humans in the presence of anemia and polycythemia. In accordance with these data, it was demonstrated that in the presence of hyperoxic hyperoxia regeneration of blood is faster in animals with experimental anemia. These investigations led to the conclusion that in intact animals decrease in erythropoiesis in the presence of hyperoxia is related to adaptation of the organism to excessive oxygen in the form of economical erythropoiesis. Author

N70-38577# Eidgenossische Technische Hochschule, Zurich (Switzerland).

PLEUROTIN: STRUCTURE AND ADDITIONS, CONTRIBUTIONS FOR BIOGENESIS [PLEUROTIN: STRUKTUR UND BEITRAEGE ZUR BIOGENESE]

Hanspeter Schelling (Ph.D. Thesis) 1969 118 p refs In GERMAN

(DISS-4319) Avail: CFSTI

Investigated are structure and biogenesis of pleurotin, an effective antibiotic against gram-positive bacteria. Chemical reduction reactions and spectroscopic analyses of Pleurotus griseus extracts give the structural formula for the molecule and the relative configurations of five of the eight chiral molecular centers. X-ray analysis of the derivative confirms this chemical structure. Radioactive labeled inclusion experiments establish that: (1) all carbon atoms of pleurotin come from aceatate; (2) pleurotin takes up more than one mevalon acid unit; and (3) Pleurotus griseus can change farnesylchinon into pleurotin. Transl. by G.G.

N70-38654# Naval Aerospace Medical Inst., Pensacola, Fla.

ISONIAZID PROPHYLAXIS AS AN AVIATION RISK: PRELIMINARY REPORT

William W. Simmons and Rosalie K. Ambler 25 Nov. 1969 26 p refs

(AD-707126; NAMI-1095; NAVMED-MF12.524-005-5015B) Avail: CFSTI CSCL 6/15

The question of the advisability of aviation personnel continuing in duties involving the actual control of aircraft while taking prophylactic isoniazid was studied. Specifically, adverse side effects of the drug were looked for both subjectively and objectively while subject personnel continued aviation duties. Fifteen aviation personnel were studied with clinical, laboratory, and psychometric examinations for a total of 862.5 person-months of drug ingestion. No significant adverse side effects which were thought to constitute a hazard to the safe performance of flying duties were detected. Although the expected incidence of adverse drug effects from isoniazid is small and no significant effects were detected for this small sample, it is suggested that a large number of subjects be studied prior to formulating a statement of policy in this regard. Meanwhile, aviation duties for personnel undergoing 300-mgm isoniazid therapy are judged to be allowable provided the flight surgeon maintains close scrutiny over such men. The long duration of the isoniazid therapy makes it economically desirable to continue personnel in a flight status. Author (TAB)

N70-38693# Aerospace Medical Div. Aeromedical Research Lab. (6571st), Holloman AFB, N.Mex.

PROTECTIVE MEASURES AGAINST ACCIDENTAL DECOMPRESSION IN SPACE AND ATMOSPHERIC FLIGHT

Harold J. von Beckh Mar. 1970 70 p refs

(AD-705563; Rept-6571-ARL-TR-70-4) Avail: CFSTI CSCL 6/19

Rapid decompression experiments with humans and animals are synthesized in up-to-date tables and the etiology and symptomotology of the decompression syndrome including the subsequent hypoxic stress are discussed. Special consideration is given to Time of Useful Consciousness (TUC) and Total Rescue Time (TRT), as limiting factors for rescue operations. Compartmentalization is suggested as a protective measure for both spacecraft and stratospheric aircraft; the operational aspects are discussed in detail. Division of space stations into two or more compartments, which are separated by airlocks, would offer additional advantages such as (1) the possibility to conduct controlled decompressions in case of fire or contamination by noxious agents in one of the compartments, (2) use of the airlock as a hyperbaric chamber for immediate therapy of decompression victims, and (3) use of the airlock as a radiation shelter during periods of increased radiation intensity. For the protection of crews who are exploring the surface of another planet or the moon, it would be desirable to provide easily transportable, lightweight, Minishelters, consisting of a small pressurized compartment with an airlock. As the exploratory expedition advances, these shelters should be distributed like relays on strategic points in order to assure recompression of the explorers before TRT has elapsed. International standardization of spacecraft components such as entrance hatches, electronic monitoring devices, and life support components is suggested. Author (TAB)

N70-38838 National Lending Library for Science and Technology, Boston Spa (England).

AN ASSESSMENT OF CONDITIONS FOR HUMAN BEINGS IN THE OPEN AIR IN WINTER, WITH ALLOWANCE FOR THE MICROCLIMATE OF A BUILT-UP AREA

V. N. Adamenko et al 9 Apr. 1970 12 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 248, 1969 p 74–81

(NLL-M-9114-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: .1 NLL photocopy coupon

Wind speed effects on the microclimate of cities and on the heat balance of human beings living in built-up areas are considered. Different combinations of air temperatures and wind speeds are reduced to a single index, representing heat emission from exposed parts of the body in calm conditions, for calculating the probable time of freezing necessary to induce frostbite in various climatic regions. Obtained relationships and nomograms can be used for estimating also the discomfort of a person's residence, depending on the type of built-up area, for which the wind field is known. G.G.

N70-38855# Hayes International Corp., Birmingham, Ala.

VALVE BIOLOAD REDUCTION AND STERILIZATION STUDY

A. N. James, Jr. and C. P. Houser 8 May 1968 40 p refs

(MD-226-68; R-ME-MM-97) Avail: CFSTI

Information is provided about existing contamination levels of hardware during manufacturing and assembly operations. The effect and effectiveness of certain decontamination and sterilization methods upon flight-accepted hardware are determined. A biostatistical method was designed and applied to provide a technique for data analysis. Author

N70-38858# Joint Publications Research Service, New York.

BIOLUMINESCENCE OF THE SEA

I. I. Gitelzon 24 Aug. 1970 11 p Transl. into ENGLISH from Biolyuminestsentsiya (USSR), 26 Nov 1969 p 3 5. 153 159. 182 183

(JPRS-51226) Avail: CFSTI

Bathyphotometers were used to measure light emitted by plant and animal sea life. The measurements revealed the regularities in verticle and geographic distributions of biolumenscence, and the basic mechanisms determining its diurnal rhythm. Also revealed was the mechanism of chemical reactions leading to radiation, to derive in a pure form the substratum and fermet of reactions, and in many instances to reproduce it in vitro. Author

N70-38873# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

FOOT OPERATION OF CONTROLS: SPEED OF ACTIVATION AND EXERTION OF FORCE TO PEDALS. PERCEPTION, SPEED AND ACCURACY OF LEG AND FOOT MOTIONS

K. H. E. Kroemer Feb. 1970 40 p refs

(AD-707142; AMRL-TR-69-57) Avail: CFSTI CSCL 5/8

The literature pertaining to foot operation of controls is reviewed and a new experiment is reported. Published experimental results clarify only some isolated aspects of leg and foot motions. Even the relatively often investigated speed of operating pedals and forces that can be applied to them have been studied under such different experimental conditions that no general statements are possible concerning what pedal can be operated most quickly or forcibly. Opinions about the advantages and disadvantages of hand versus foot operation do not appear to be based on experimental findings. In an experiment, seated young adult male subjects moved the right foot as rapidly as possible over distances of 15 cm to circular targets. The direction of these discrete movements was studied for accuracy of motion. Author (TAB)

N70-38881# Library of Congress, Washington, D.C. Science and Technology Div.

AIR POLLUTION PUBLICATIONS: A SELECTED BIBLIOGRAPHY WITH INDEXES, 1966–1968

1969 532 p refs Prepared for Natl. Air Pollution Control Admin.

(Publ-979) Avail: SOD $4.50

The selected references cover emission sources of air pollution, measurement, control, effects on man, fauna, flora, and materials, air quality standards, legal and social aspects, and basic science and technology. The bibliography is arranged in subject categories and an author and subject index is provided. R.B.

N70-38900# Vermont Univ., Burlington. Dept of Psychology.

MAN IN ISOLATION AND/OR ENCLOSED SPACE: REPORT OF ACTIVITIES AT NATO SYMPOSIUM IN ROME, ITALY, 20-24 OCTOBER 1969

Donald G. Forgays and James M. Levin 1969 19 p refs

(Contract F44620-69-C-0001; Proj. Themis)

(AD-706377; AFOSR-70-1409TR; TR-1) Avail: CFSTI CSCL 5/10

A NATO symposium on man in isolation and/or enclosed space took place in Rome, Italy. The report summarizes the activities of the symposium, describes the more significant ideas resulting from the symposium and follow-up activities, and outlines briefly a new program of research of apparent importance to space activities and other military and non-military systems. Author (TAB)

N70-38910 Oklahoma Univ., Norman.

EFFECTS OF EARMOLD ALTERATION UPON SOUND PRESSURE LEVELS GENERATED IN THE HUMAN AUDITORY MEATUS

Frank Douglas McDonald (Ph.D. Thesis) 1969 120 p

Avail: Univ. Microfilms: HC $5.80/Microfilm $3.00 Order No. 69-18456

Investigated are sound pressure level (SPL) changes occurring in the human auditory meatus, as determined with a probetube microphone system, when an earmold having a standard form was modified to a form having a shortened-hollowed canal, a form having a shortened-hollowed-vented canal, and a form which was nonoccluding relative to the ear canal of the wearer. Two preliminary procedures were also accomplished which measured SPL's in couplers. One of these concerned measurements with a hearing-aid receiver placed directly upon the standard 2cc coupler. The other involved measurements in a special 2cc coupler, with earmold A interposed between the receiver and the 2cc cavity of the special coupler. Acoustical explanations of the findings are presented relative to the frequency-response curves of each measurement condition. Results of calculations of sound-power-transmission ratios expressed in decibel losses, Helmholtz resonators, and tube-length resonators are presented in order to explain the principal features of the response curves obtained under the various test conditions. Dissert. Abstr.

N70-38913# Naval Submarine Medical Center, Groton, Conn. Research Lab.

EFFECTS OF EXPOSURE TO INTENSE LOW FREQUENCY TONES ON HEARING AND PERFORMANCE Interim Report

Paul F. Smith, Martin S. Harris, Joseph S. Russotti, and Cecil K. Myers 26 Jan. 1970 10 p refs

(AD-707364; SMRL-610; NAVMED-MF12-524-004-9012D) Avail: CFSTI CSCL 6/19

Groups of men were exposed for a twenty-four hour period to either 70 Hertz tones at 112.8 plus or minus 10 dB re .0002 dynes/cm sq. or 300 Hertz tones at 113.4 plus or minus 3 dB re .0002 dynes/cm sq. During the exposure, performance on a sensory-motor task was tested periodically, and auditory threshold shifts were measured. Author (TAB)

N70-38917# Army Foreign Science and Technology Center, Washington, D.C.

MAN AND TECHNOLOGY. ESSAYS ON ENGINEERING PSYCHOLOGY [CHELOVEK I TEKNIKA. OCHERKI INZHENERNOY PSIKHOLOGII]

B. F. Lomov 9 Feb. 1970 555 p refs Transl. into ENGLISH from *Chelovek i Tekhn. Ocheri Inzh. Psikologii (Moscow)*, 1966 p 1-463

(AD-706544; FSTC-HT-23-827-70) Avail: CFSTI CSCL 5/5

The book gives a description of the basic problems of engineering psychology, notes the experimental data which have been accumulated and indicates certain ways for accomplishing future research. It examines the most general characteristics of man as an element of a control system, the speed, accuracy, and reliability of his actions. Attention is directed to problems of receiving and processing information by man. These deal with the physical properties of the signal involved, evaluation of the quantity of information man can receive, and finally by what psychic such information is received. The major emphasis of the book is on the interaction of men and machines in a control system. Author (TAB)

N70-38924 National Lending Library for Science and Technology, Boston Spa (England).

TEMPORARY AND PERMANENT AUDITORY DECREASE AFTER DAMAGE TO HEARING CAUSED BY NOISE

F. Debaillie et al 2 Apr. 1970 10 p refs Transl. into ENGLISH from T. Soc. Geneesk., v. 46, no. 7, 1968 p 252-256

(NLL-CE-Trans-5305-(9022.09)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

The possibilities of recovery from auditory fatigue in the case of a group of 54 workmen exposed to a high, continuous noise level were examined. After the end of exposure four tests were made during work, and after 48 to 56 hours, 9 days, and 17 days rest. The progress of recovery from auditory fatigue was examined according to the degree of auditory injury, the number of years of exposure to noise, and the ages of the exposed persons. Author

N70-38958 National Lending Library for Science and Technology, Boston Spa (England).

POLLUTION OF ATMOSPHERIC AIR

M. M. Cernavskaja 24 Jun. 1970 8 p refs Transl. into ENGLISH from *Izv. Akad. Nauk SSSR, Ser. Geog. (USSR), no.* 5, 1969 p 134-136

(NLL-M-9197-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

Air pollution is discussed on a world-wide basis. Two basic categories are considered; impurities coming directly from sources, and impurities formed in the atmosphere by the interaction of primary products with other primary products, or with components of the atmosphere. This latter is demonstrated by oxides of nitrogen and hydrocarbons, emitted by road transportation vehicles, exposed to solar radiation form photo-oxidants which have a harmful effect on organisms. A serious problem is considered the pollution of the upper layers of the troposphere and stratosphere, particularly as little is known about the diffusion and transport of impurities at these heights. The economic effects, such as more electric power consumption because of less natural illumination, loss in agricultural production, and sickness, are also discussed. F.O.S.

N70-38978 National Lending Library for Science and Technology, Boston Spa (England).

INVESTIGATION OF THE DYNAMICS OF CARDIAC OUTPUT IN PATIENTS WITH HEART DEFECTS, USING AN ULTRASONIC INTRAVASCULAR TRANSDUCER [ISSLEDOVANIE DINAMIKI SERDTSA PRI POMOSHCHI ULTRAZVUKOVONO VNUTRISOSUDISTOVO DATCHIKA]

A. A. Vishnevskii et al Jul. 1970 12 p refs Transl. into ENGLISH from Eksp. Khir. Anesteziol. (USSR), v. 13, no. 4, 1968 p 6-11

(NLL-RTS-5969) Avail: Natl. Lending Library, Boston Spa, Engl.: 22s or 4 NLL photocopy coupons

Hemodynamic properties of patients with heart diseases were studied by quantitative appraisal of their blood stream velocities in aortas and main vessels through introduction of ultrasonic transducers into cardiac chambers and femoral arteries. Measurements were analyzed for variations in intracardiac pressure, heart muscle potentials, heart wall movements, etc., throughout the cardiac cycle. G.G.

N70-39004# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.

SPECTRAL MODIFICATIONS IN UV IRRADIATED SOLUTIONS OF T2 PHAGE DNA

M. Cremonese, G. Giampaoli, M. Matzeu, and G. Onori 22 Sep. 1969 30 p refs

(ISS-69/38) Avail: NTIS

The modification produced by UV radiation on the native DNA of the T2 phage is presented. The spectral modifications produced in the absorption spectra of the irradiated solutions are revealed. These modifications reach values of approximately 10%. We observe a lowering of the O. D. in the wavelength range 2400 < lambda < 3000 A, with a maximum at lambda approximately equals 2700 A; it corresponds to the disappearance of the thymine molecule. Vice versa there is an increase of the O. D. at lambda >3000 A, which indicates the presence of photoproducts with an

absorption maximum at lambda = 3250 A. From the interpretation of the spectra, the formation of thymine dimers and of another photoproduct can be seen. For low doses of radiation the thymine dimers are predominant but at high doses the opposite occurs. This procedure allows an evaluation of the cross sections for the photoproduct formation at the wavelengths of irradiation. Author

N70-39029# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
SECOND PROGRAMMING COURSE ON THE APPLICATIONS OF ELECTRONIC COMPUTERS IN BIOLOGY AND MEDICINE. PART II: EXERCISES OF STATISTICS
25 Jan. 1969 57 p In ITALIAN; ENGLISH summary
(ISS-69/10) Avail: NTIS

Exercises in statistical problems are presented by analyzing the birth weight of males with six months gestation. Topics discussed include: variational analysis, regression analysis, and statistical distributions. Results are tabulated. Transl. by F.O.S.

N70-39081 Wisconsin Univ., Madison.
AEROBIC AND ANAEROBIC PERFORMANCE CHARACTERISTICS OF CHAMPION RUNNERS AT SEA LEVEL AND MODERATE ALTITUDE
Jack Tupper Daniels (Ph.D. Thesis) 1969 201 p
Avail: Univ. Microfilms: HC $9.25/Microfilm $3.00 Order No. 69-12353

Twenty-four middle-distance runners, in training for the 1968 Olympic Games in Mexico City, were studied at sea level and at a 7300-foot altitude. Various physiological adjustments to different initial running speeds were measured while the subjects ran on a 400-meter track. Oxygen costs for the various intensities of work were estimated, and by subtracting the measured values for oxygen consumption, oxygen deficits were calculated. Increased speeds at the start of running were accompanied by increased rates of aerobic metabolism. Therefore, the initial oxygen deficits did not vary significantly with changes in first-lap running speeds from as much as five seconds slower to five seconds faster than race pace, as long as the race pace was within the aerobic capacity of the subjects. Among milers, starting speeds of five seconds faster than race pace resulted in greater O2 deficits than those related to initial laps four to five seconds slower than race pace. Dissert. Abstr.

N70-39159# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
QUANTITATIVE SAFETY ANALYSIS
J. W. Croach and L. M. Arnett Apr. 1970 52 p
(Contract AT(07-2)-1)
(DP-1207) Avail: NTIS

An analytical method is developed to assess the safety of an operation or a mission. A computer program, Probabilistic Analysis of Risk (PAR), is written to implement the quantitative features of this method. The analysis can incorporate judgment factors and can assess the results of accepting each of several alternatives. Author

N70-39162# Sloan-Kettering Inst. for Cancer Research, New York.
THE BIOLOGICAL EFFECTS OF TRITIUM
Helen Q. Woodard AEC 18 May 1970 49 p refs
(HASL-229) Avail: NTIS

A literature survey is presented on the following topics: tritium hazards to personnel of nuclear reactors; hazards to populations following nuclear explosions; hazards to personnel in biological and medical research; uptake and loss of tritiated water; incorporation of tritium from HTO into body components; model for computing radiation dose from acute acquisition of tritium as HTO by man; nature of biological effects of tritium; and mechanisms of biological effects of tritium. It is concluded that the types of possible human exposure to tritium fall into the following groups: acute exposure to large concentrations of tritiated water or tritium gas during accidents at nuclear reactors or during the manufacture of tritiated compounds; chronic exposure to low levels of activity in contaminated environments; and acquisition of tritiated compounds by laboratory personnel through accidental ingestion, injection, inhalation, or contamination of the skin. NSA

N70-39191# California Univ., Berkeley. Lawrence Radiation Lab.
GENERATOR-PRODUCED KRYPTON-81m FOR DYNAMIC STUDIES OF THE LUNGS AND HEART WITH THE SCINTILLATION CAMERA
Y. Yano, J. McRae, and H. O. Anger Apr. 1970 11 p refs Presented at Prepn. and Control of Radiopharmaceuticals Conf., Vienna, 11 – 15 May 1970 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-19785; Conf-700517-2) Avail: NTIS

Krypton-81m is obtained in multimillicurie amounts from its cyclotron-produced parent isotope 4.7-hr Rb-81. The 13-sec Kr-81m daughter decays by isomeric transition and emission of a monoenergetic 190-keV gamma which is 35% internally converted. Dynamic perfusion studies are done with Kr-81m by injecting the sterile saline-Kr-81m solution intravenously and taking 1- to 3-sec exposures with the scintillation camera. Blood flow through the right heart, pulmonary arteries, and lungs is visualized. Krypton-81m is obtained as a gas from the same generator system by eluting the dry resin column with air. This mixture of Kr-81m and air is inhaled by the patient to provide ventilation and exchange studies of the lungs. Five to six mCi of Kr-81m can be given every few minutes to obtain different views or to repeat studies of patients. The high photon yield, moderate gamma ray energy for scintigraphy, and short half-life (which keeps the radiation dose to a low level) make Kr-81m an ideal radionuclide for dynamic studies with the scintillation camera. NSA

N70-39201# Joint Publications Research Service, Washington, D.C.
SPACE BIOLOGY AND MEDICINE, VOLUME 4, NO. 3, 1970
4 Sep. 1970 143 p refs Transl. into ENGLISH of the periodical "Kosmicheskaya Biologiya i Meditsina" Moscow, Medgiz., 1970 p 1 – 88
(JPRS-51315) Avail: NTIS

The results of investigations related to aerospace medicine are reported, including life support systems, hypokinesia effects on organisms, radiation effects on biological and physiological functions, medical monitoring systems and bioinstrumentation, and acceleration effects on the vestibular function in animals. For individual titles, see N70-39202 through N70-39223.

N70-39202# Joint Publications Research Service, Washington, D.C.
INVESTIGATION OF WATER EXCHANGE IN A BIOLOGICAL LIFE SUPPORT SYSTEM BASED ON ALGOBACTERIAL CULTURE
I. I. Gitelzon et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 1 – 9 refs (See N70-39201 22-04)
Avail: NTIS

Experimental data on water exchange in a biological life support system involving man and Chlorella with the concomitant microflora are discussed. Water sources within the system which can be used to satisfy human needs are evaluated. The described technological scheme of water exchange in the man-algobacterial

culture system was used in long-term experiments in which the atmosphere and water were regenerated. The water recovery parameters made possible an evaluation of water recovery and methods for its improvement in a biological life support system. Author

N70-39203# Joint Publications Research Service, Washington, D.C.

USE OF HYPEROXIC AND HYPERCAPNIC GAS MIXTURES FOR INCREASING ORTHOSTATIC STABILITY

V. I. Korolkov et al *In its* Space Biol. and Med. Vol. 4, No. 3, 1970 4 Sep. 1970 p 10–17 refs (See N70-39201 22-04)
Avail: NTIS

It was found that the breathing of gas mixtures containing high concentrations of oxygen and carbon dioxide has a favorable effect on tolerance to 15-minute tilt tests. Orthostatic stability declined in response to hypovolemia due to artificial blood loss amounting to 0.8 percent body weight. No collaptoid state developed when the animals were breathing gas mixtures containing 5% CO2, 93% O2 and 2% N2 under hypovolemic conditions. Author

N70-39204# Joint Publications Research Service, Washington, D.C.

COMBINED EFFECT OF ACUTE HYPOXIA AND HIGH AMBIENT TEMPERATURE ON ANIMALS

A. V. Sergiyenko *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 18–26 refs (See N70-39201 22-04)
Avail: NTIS

Experiments were carried out to study the combined effect of acute hypoxia increasing at different rates (2 to 500 m/sec) and different ambient temperatures (+21, 30 and 40 C) on the altitude tolerance of test animals. The tolerance was evaluated by the altitude ceiling and survival time of animals at 12,000 m and during simulated ascent at a rate of 2 to 500 m/sec. An increase in ambient temperature induced a substantial decrease in altitude tolerance due to significant disturbances in the regulatory and compensatory mechanisms resulting from the combined effect of high temperature and hypoxia increasing at different rates. An increase in the decompression rate caused an increase in the altitude ceiling and a progressive decrease in the duration of normal activity and survival at an altitude of 12,000 m. Author

N70-39205# Joint Publications Research Service, Washington, D.C.

DYNAMICS OF CHANGES IN PROTEIN METABOLISM IN RATS DURING PROLONGED HYPOKINESIA

I. V. Fedorov et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 27–31 refs (See N70-39201 22-04)
Avail: NTIS

Each rat was placed in an individual open-air compartment of a special metabolism cage fabricated from plastic materials. The tail of each rat was held to a metal pin in the cage by adhesive plaster. A plaster jacket was fitted onto each animal for immobilizing it. The jackets were cast from plastic models of the rats and corresponded to the size of the test animals. Only the snouts and front legs of the rats remained relatively free. The animals became less active with time while immobilized. In some animals bloody crusts appeared around the nose and eyes. When removed from the cages upon termination of the experiment the animals were seriously emaciated. Their fur was dishevelled, filthy in places, and was not securely attached to the skin. Their movements were constrained and unsure. Author

N70-39206# Joint Publications Research Service, Washington, D.C.

MORPHOLOGY OF THE KIDNEYS AND NEUROSECRETORY SUBSTANCE OF THE POSTERIOR LOBE OF THE HYPOPHYSIS IN RATS AFTER PROLONGED EXPOSURE TO TRANSVERSE ACCELERATION

A. S. Pankova et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 32–39 refs (See N70-39201 22-04)
Avail: NTIS

The morphological changes in the kidneys and neurohypophysis revealed a certain parallelism. Ejection of the neurosecretion preceded the appearance of morphological symptoms which reflected an increased reabsorption of water in the kidneys. The intensity of morphological changes in the neurohypophysis-kidney system was dependent on the time of exposure to accelerations. Author

N70-39207# Joint Publications Research Service, Washington, D.C.

IMMUNOBIOLOGICAL REACTIVITY OF MICE AT AN ALTITUDE OF 3000 METERS

A. S. Kaplanskiy et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 40–44 refs (See N70-39201 22-04)
Avail: NTIS

The phagocytic activity of blood neutrophils and abdominal macrophages and the antibody production of mice immunized with a killed typhoid vaccine or Vi-antigen (immunization performed on the eighth day of the exposure) remained normal. The intensity of plasma cell hyperplasia occurring in the regional lymph nodes of the immunized animals also remained unaltered. A decline in lymph node weight observed at the end of the experiment was due to a decrease in the lymphocyte count. Author

N70-39208# Joint Publications Research Service, Washington, D.C.

ELECTRON MICROSCOPE STUDY OF STRUCTURE OF THE PULMONARY ALVEOLAR AND CAPILLARY WALLS DURING STRESS

R. S. Morozova et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 45–53 refs (See N70-39201 22-04)
Avail: NTIS

The results of a comparative electron microscope examination of the air-blood barrier in the lungs of mammals kept under normal conditions, exposed of transverse accelerations, and kept under conditions of mechanically modified pulmonary circulation are given. The latter changes are similar to those developing in response to acceleration. Under normal conditions the air-blood barrier is continuous, consisting of the alveolar epithelium, capillary endothelium, and the basal membrane situated between them. Under conditions of transverse accelerations and modified hemodynamics the structure of the air-blood barrier undergoes significant changes involving an increase in barrier thickness due to the development of collagen fibrils between the epithelium and endothelium. Author

N70-39209# Joint Publications Research Service, Washington, D.C.

DNA SYNTHESIS AND RATE OF BONE MARROW CELL DIFFERENTIATION IN DOGS EXPOSED TO RADIATION SIMULATING EXTENDED SPACE FLIGHT

A. V. Ilyukhin *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 54–61 refs (See N70-39201 22-04)
Avail: NTIS

The irradiation pattern simulated the environment in space cabins during extended space flights. The dogs were irradiated for 12 to 16 months. The tested parameters changed insignificantly and reversibly during single 50-rem irradiations of the animals. No significant changes in DNA synthesis or the rate of cell maturation occurred during chronic irradiations of the animals with total of 25, 75, and 150 rem per year. Author

N70-39210# Joint Publications Research Service, Washington, D.C.
COMPARATIVE EVALUATION OF RADIOBIOLOGICAL EFFECTS OF VARIOUS TYPES OF PARTIAL PROTECTION
Yu. G. Grigoryev et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 62–69 refs (See N70-39201 22-04)
Avail: NTIS

The effectiveness of partial body protection of dogs irradiated by 250 MeV protons at the minimum absolutely lethal dose (350 rad) is discussed. Paraffin blocks were used for shielding 15 percent of the body: head, chest, upper and lower abdomen, pelvic region or hind legs. The partial protection of any part of the body appeared effective and all the experimental animals survived. The effect was most pronounced when the chest and pelvis were shielded. A distinct relationship was discovered between the effect of partial body protection and the amount of shielded bone marrow. Author

N70-39211# Joint Publications Research Service, Washington, D.C.
THE MEDICAL MONITORING SYSTEM ABOARD SOYUZ SPACESHIPS
Yu. G. Nefedov et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 70–78 refs (See N70-39201 22-04)
Avail: NTIS

The general principles applied in designing the medical monitoring system for the Soyuz-3, Soyuz-4 and Soyuz-5 spacecraft are presented. The physiological parameters monitored and the information sources used are described. The structural diagram of the medical instrumentation and biosensors is described. The principles of instrument design, storage, processing, and analysis of physiological data are discussed. The layout of the medical monitoring equipment is described, the system of biosensors is illustrated and examples of telemetric registry of physiological parameters are given. Author

N70-39212# Joint Publications Research Service, Washington, D.C.
SOME ASPECTS OF MEDICAL SUPPORT FOR PROLONGED SPACE FLIGHTS
G. L. Yaroshenko et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 79–82 refs (See N70-39201 22-04)
Avail: NTIS

Minimum requirements for medical support can be determined on the basis of a prediction of space crew morbidity. Most stress factors inherent in space flights occur on the earth, causing disorders in healthy persons. Accordingly, disturbances and diseases developing in subjects who have long worked under stress conditions or who have been exposed to simulated stress effects may be used as reference data for pertinent predictions. A method is suggested for predicting disturbances and diseases during prolonged space flights. The method may help in determining the medical items which must be included in space kits, ascertaining the degree to which cosmonauts should receive medical training, and developing recommendations on medical equipments. Author

N70-39213# Joint Publications Research Service, Washington, D.C.
USE OF THERMAL STRESS AS A FUNCTIONAL-DIAGNOSTIC TEST IN EXAMINING COSMONAUTS
Ye. I. Kuznets et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 83–89 refs (See N70-39201 22-04)
Avail: NTIS

In examining cosmonauts it is proposed that they be exposed in a medium with a temperature of about 50 deg with a relative humidity of 85 to 90%, this constituting a functional and diagnostic test. Thermal tolerance can be evaluated on the basis of heart rate, arterial pressure, rectal temperature, water losses, accumulated heat, and exposure time. The values of these parameters established as the limit of human thermal tolerance are given. Author

N70-39214# Joint Publications Research Service, Washington, D.C.
PRELIMINARY PHYSICAL TRAINING AS A FACTOR INCREASING TOLERANCE TO WATER IMMERSION
Ye. I. Kuznets et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 90–97 refs (See N70-39201 22-04)
Avail: NTIS

Nine health test subjects 22 to 32 years old were exposed to a 24-hour water immersion experiment before and after a special physical training program which involved various exercises to increase general endurance and strength. It was shown that general and static endurance, strength, speed, cardiovascular, and respiratory responses to maximum speed and dynamic loads were more stable in water immersion experiments which followed physical exercises. Author

N70-39215# Joint Publications Research Service, Washington, D.C.
EFFECT OF CYCLIC ATMOSPHERIC CHANGES ON HUMAN BASAL METABOLISM DURING PROLONGED HYPOKINESIA
G. F. Makarov *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 98–102 refs (See N70-39201 22-04)
Avail: NTIS

Two health test subjects were confined to an altitude chamber for 35 days. The experiment consisted of five cycles lasting seven days each. On the third day the atmosphere was hypoxic (PO2 = 110 + or – 5 mm Hg), on the fourth day it was hypoxic (PO2 = 110 + or – 5 mm Hg) and hypercapnic (PO2 = 15 + or – 3 mm Hg), on the seventh day it was hyperoxic (PO2 = 320 + or – 10 mm Hg) and on the remaining days a normal atmosphere was maintained. The results of the preliminary experiments suggest that cyclic alternations of hypoxia and hypoxia combined with hypercapnia may give a stimulating effect which compensates for a hypokinesia-induced decline in metabolism. Author

N70-39216# Joint Publications Research Service, Washington, D.C.
EFFECT OF A REDUCED DIET AND HYPOKINESIA ON HUMAN TOLERANCE TO STATIC LOADS
M. A. Cherepakhin *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 103–110 refs (See N70-39201 22-04)
Avail: NTIS

Three series of experiments, each 15 days in duration were run on 18 subjects in the age group 24 to 27 years. In all the experiments the subjects were fed a ration 1800 cal/day consisting of lyophilized foods. The first series the motor activity regime was unrestricted. In the second series the subjects adhered to a rigorous bed confinement. In the third series the conditions differed from those in the second in that before and after the experiments the test subjects were exposed to accelerations in a chest-to-back direction (8 g) for a period of 120 seconds. A diet of lyophilized foods with a normal motor activity regime exerts no effect on human tolerance to static loads. Hypokinesia in the form of bedrest confinement for 15 days with a diet of lyophilized foods in a quantity of 1800 cal/day exerts a negative effect on human tolerance to stress. A static functional test is recommended for predicting human tolerance to accelerations. The test can be made in small-volume chambers, in bed, in a fixed position, or in a spacesuit. Author

N70-39217# Joint Publications Research Service, Washington, D.C.

SEARCHLESS ULTRASONIC DOPPLER CARDIOGRAPHY

V. G. Voloshin et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 111-113 refs (See N70-39201 22-40)
Avail: NTIS

A method of searchless ultrasonic Doppler cardigraphy (UZDK) is discussed which makes it possible to determine the phases of the cardiac cycle from a curve recorded from the precardiac region using a fixed pickup without any special search for the valves. A transistorized variant of a Doppler 'cardioradar' was fabricated for the experiment. The studies revealed the characteristic changes in amplitude, frequency, and form of the UZDK specific for each phase, both systolic and diastolic. The complete identity of the phase structure was demonstrated by the searchless UZDK and other methods. R.B.

N70-39218# Joint Publications Research Service, Washington, D.C.

ADMISSABLE ERROR IN MEASURING THE BASIC PARAMETERS OF HUMAN MASS EXCHANGE

Yu. I. Aganin *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 114-119 refs (See N70-39201 22-04)
Avail: NTIS

The mean normal daily consumption determining the nominal capacities of tanks designed for the storage of supplies and wastes and the output of regeneration equipment is discussed with respect to life support systems for a spacecraft crew. Two examples of evaluating the error in measurement of human mass exchange are given: using the criterion of minimum cost of a ground experiment and the criterion of minimum weight of the life support system. R.B.

N70-39219# Joint Publications Research Service, Washington, D.C.

USE OF HYPOTHERMIA FOR PREVENTING THE NEGATIVE EFFECT OF OXYGEN INADEQUACY ON VESTIBULAR RELFEXES

I. I. Voinova *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 120-123 refs (See N70-39201 22-04)
Avail: NTIS

Nystagmus and respiration rate in response to adequate stimulation of the vestibular apparatus were investigated in 60 white rats subjected to hypothermia. The rats were placed on a special electrically rotated stand with a wide range of angular accelerations and the reactions were registered on an encephalograph. The experiments reveal that the intensity of the vestibular reactions in the cooled rats is considerably reduced in comparison with the reactions for intact animals. The reactions did not differ significantly before and after exposure to a simulated altitude of 15,000 m. After the rats are warmed, the reaction is restored to the initial level after 40 to 50 minutes. The number and duration of nystagmoidal movements in uncooled animals almost doubled in a rarefied atmosphere, and the reaction has not returned to normal 1.5 hours after removal from the pressure chamber. The mortality rate among animals cooled to 25 deg was half that of intact animals at an altitude of 13,000 m. R.B.

N70-39220# Joint Publications Research Service, Washington, D.C.

ELECTRIC REACTIONS OF VASOMOTOR NEURONS TO DIRECT STIMULATION OF THE VESTIBULAR NERVE IN CATS

R. A. Grigoryan et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 124-129 refs (See N70-39201 22-04)
Avail: NTIS

The reaction of the vasomotor neurons in response to direct electrical stimulation of the vestibular branch of the eighth pair of cranial nerves was investigated as a basis for more thorough study of vestibular-vascular impairments. A total of 53 neurons with background activity was recorded. Some of the neurons were characterized by stable uniform discharges, while others displayed a frequency modulation from one to ten spikes per second. On the basis of the experiments, the vasomotor neurons are classified into two groups using the criterion of vestibular nerve response to stimulation by individual impulses of equal intensity. The results indicate that only a small part of the vasomotor neurons can be innervated monosymptically by the primary vestibular afferent fibers, while the majority is activated through intermediate relays, including the triangualr nucleus and some cell groups in the vestibular nuclei. R.B.

N70-39221# Joint Publications Research Service, Washington, D.C.

CHANGE IN THE TOPOGRAPHY OF LIPID DISTRIBUTION IN THE SUPRARENAL CORTEX UNDER THE INFLUENCE OF 'NEGATIVE' ACCELERATIONS

V. V. Yazvikov et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 130-131 refs (See N70-39201 22-04)
Avail: NTIS

The histophysiology of the suprarenal cortex was investigated at different times after exposure to sublethal accelerations. White mice were subjected to an acceleration of 92 g on a laboratory centrifuge for one minute. The animals were placed in rotor recesses at an angle of 45 deg to the vector of centripetal acceleration and the radius of heat rotation was a maximum of 4.5 cm. The study shows that neutral fats in the suprarenal cortex are localized primarily in the fascicular zone of the control animals, with fewer fats in the glomerular zone, and virtually none in the reticular zone. Immediately after centrifuging the content of neutral fats in the glomerular and fasicular zones is considerably reduced, but increases in the reticular zone. During a period of 56 hours the fats are redistributed among different cortical zones. The redistribution of fats in the cortical zones indicates that the hormonal spectrum of the organ is not constant during this period and differs from the normal spectrum. Periodic normalization of fat localization may also indicate a cyclicity in the process. R.B.

N70-39222# Joint Publications Research Service, Washington, D.C.

VIABILITY OF CHLORELLA IRRADIATED BY 645 MeV PROTONS

I. S. Sakovich et al *In its* Space Biol. and Med., Vol. 4, No. 3, 1970 4 Sep. 1970 p 132-135 refs (See N70-39201 22-04)
Avail: NTIS

The viability of Chlorella pyrenoidosa SP-K was investigated during irradiation and subsequent cultivation in the exponential growth segment of an asynchronous culture in a fluid Tamiya nutrient medium. The range of radiation doses was from 0.5 to 50 krad. After irradiation the increase in optical density of the culture was observed and the percentage of effectively surviving cells and the duration of the latent and transient period were determined. The values of the parameters are given in tabular form. R.B.

N70-39223# Joint Publications Research Service, Washington, D.C.

SWEET POTATO TOLERANCE TO IONIZING RADIATION

D. F. Gertsuskiy et al *In its* Space Biol. and Med., Vol. 4, no. 3, 1970 4 Sep. 1970 p 136-138 refs (See N70-39201 22-04)
Avail: NTIS

Young freshly cut grafts of sweet potato were irradiated with cobalt 60 gamma rays with doses of 0.5, 1, 2, 5, 8, 10, and

20 krad. The irradiated and control grafts were placed in containers with a nutrient solution for determining their capacity to take root. The rooted grafts and sprouts were set out in a specialized greenhouse and cultivated for 85 and 100 days by the hydroponics method on a Knopp's nutrient solution under illumination of ZN-8 mirror lamps. The results show that a dosage of more than 8 krad is lethal for the grafts and approximately 50% of the plants to 5 krad die. In the surviving plants the roots were poorly formed and the plants lagged considerably behind the controls in growth and development. Author

N70-39248 California Univ., Berkeley.
ORGANIC GEOCHEMISTRY
William Van Hoeven, Jr. (Ph.D. Thesis) 1969 254 p
Avail: Univ. Microfilms: HC $11.50/Microfilm $3.30 Order No. 69-18984

Organic geochemical research on the origin of life is discussed in a historical and scientific context. The concept of biological markers and chemical fossils are discussed in detail. Each of the four major classes of biochemicals, carbohydrates, proteins and peptides, nucleic acids, and lipids are analyzed as to the suitability, either of individual compounds or of conglomeration within a compound type, for use as chemical fossils. Structural specificity, biosynthetic relatability, possible abiotic synthesis, and thermal stability are discussed. Experimental results relevant to the origin of life problem are described. The alkane constituents of nine geological samples ranging in age from 2000 to 27 billion years were examined. Some pigments were identified in the two youngest sediments and fatty acids from the six oldest samples were also examined. Dissert. Abstr.

N70-39269# Illinois Univ., Urbana. Dept. of Physics and Materials Research Lab.
DELAYED FLUORESCENCE AS A PROBE OF RADIATIONLESS TRANSITIONS IN ANTHRACENE AND ALGAE
William Turlay Stacy (Ph.D. Thesis) Jun. 1970 119 p refs
(Contracts AT(11-1)-1198; DA-ARO(D)-31-124-G-873; ARPA SD-131)
(COO-1198-722) Avail: NTIS

In the case of crystalline anthracene, the blue light-excited delayed fluorescence is used to study the temperature dependence of monomolecular intersystem crossing. The associated rate constant k is found to obey an equation of the form k = k sub 1 + k sub 2 exp(-E/k sub B T) where E = 1/900 + or - 100 cm and k sub 2/k sub 1 = 800 + - 200. A calculation of the relevant Franck-Condon factors using the method developed by Seibrand yields good agreement with the experimental value of k sub 2/k sub 1. At temperatures below 90 K, the temperature dependence of the delayed fluorescence intensity exhibits a pronounced maximum which is qualitatively explained in terms of triplet exciton traps. The delayed fluorescence emitted by algae is explained in terms of a triplet exciton fusion model in which the production of triplets is mediated by a photochemical reaction center. At low light levels, the delayed fluorescence intensity is proportional to the square of the excitation intensity. Author

N70-39270# Joint Publications Research Service, Washington, D.C.
HEURISTIC SELF-ORGANIZATION OF CYBERNETIC SYSTEMS
O. G. Ivankhnenko 2 Sep. 1970 22 p refs Transl. into ENGLISH from Visnyk Akad. Nauk. Ukr. RSR (Kiev), no. 7, 1970 p 23-27
(JPRS-51301) Avail: NTIS

Heuristic self-organization is discussed as the principle direction in the development of technical cybernetics. The different terms used in cybernetics are defined and specific and general approaches to the discipline are discussed. The perceptron, a model of functions of perception and recognition of the brain, is suggested as the optimal approach to which the mathematical single-row theory of statistical solutions must be expanded to a multi-row theory. R.B.

N70-39280*# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
TOXICOLOGICAL SCREENING OF SPACE CABIN MATERIALS
Gerd A. Kleineberg and Anthony A. Thomas *In* NASA, Washington Proc. of the 7th Ann. Working Group on Extraterrest. Resources 1970 p 31-38 refs (See N70-39276 22-30)
(AMRL-TR-69-53) Avail: SOD $1.50; NTIS CSCL 05E

The effects of long-term continuous exposure to low concentrations of environmental contaminant are studied. To control toxic contaminants in space cabins and to identify individual gas-off stringent material selection and analytical gas-off studies are performed. Since 1965, 287 materials have analyzed prior to toxicological evaluation. Criteria for the screening process and methods for detailed gas-off studies are described. The effects of reduced atmospheric pressure and oxygen-rich atmospheres on the characteristics of truly uninterrupted long-term exposure to toxic trace contaminants are also studied. A brief description of the altitude inhalation exposure facility is given. Toxicological screening is performed by continuously exposing rats and mice to the gas-off products of candidate materials within a closed-loop life-support system which in turn is located inside a Thomas dome. Two hundred ninety materials were screened for 7-day acute toxicity, and materials were studied for a 60-day duration. Results of the toxiocological evaluations are discussed. Author

N70-39281*# Army Natick Labs., Mass.
FEEDING MAN IN SPACE
H. A. Hollender and Mary V. Klicka *In* NASA, Washington Proc. of the 7th Ann. Working group on extraterrest. Resources 1970 p 39-49 refs Sponsored in part by Air Force (See N70-39276 22-30)
Avail: SOD $1.50; NTIS CSCL 06H

The development of space flight foods is reviewed and the types of food for different flights are described. The developmental problems such as crumbling, coating, and water impurities are discussed. The five categories of food used are sterile semi-solid foods, bite-size dehydrated foods to be eaten dry, precooked dehydrated foods to be reconstituted with water (rehydratables), thermally stabilized flexibly packaged wet foods, and intermediate moisture foods. N.E.N.

N70-39310# Joint Publications Research Service, Washington, D.C.
CYBERNETIC SYSTEMS AND BIOLOGY
28 Aug. 1970 25 p refs Transl. into ENGLISH from Filosofska Dumka (Kiev), no. 3, 1970 p 30-38 60-67
(JPRS-51270) Avail: NTIS

CONTENTS:

1. CLASSIFICATION OF CYBERNETIC SYSTEMS DISCUSSED O. A. Bratko et al p 1-12 refs (See N70-39311 22-50)
2. DISCUSSION OF THE ORGANISM-ENVIRONMENT PROBLEM V. A. Baraboy p 13-23 refs (See N70-39312 22-04)

N70-39311# Joint Publications Research Service, Washington, D.C.

N70-39312

CLASSIFICATION OF CYBERNETIC SYSTEMS DISCUSSED
O. A. Bratko et al *In its* Cybernetic Systems and Biol. 28 Aug. 1970 p 1–12 refs (See N70-39310 22-05)
Avail: NTIS

Depending on the conception of the theory of reflection, a definition of an adequate criterion of the level of a cybernetic system is suggested. Further, proceeding on this reflection theory, and regarding reflection as the central direction of the perfection of systems, the main element upon which a single-valued classification of systems can be based is delineated. Along with this element and with a classification criterion for systems, the mechanism of reflection of the systems is acknowledged. This mechanism can be defined as a material substrate whose structure determines the constantly repeating sequence of reactions of certain influences external to the given substrate. The fact that this mechanism has a definite material structure which is subject to investigation and measurement makes it possible to apply various forms of description and characterization to the mechanism, including the method of the general theory of systems. However, the problem of the classification of cybernetic systems remains unsolved. Author

N70-39312# Joint Publications Research Service, Washington, D.C.
DISCUSSION OF THE ORGANISM-ENVIRONMENT PROBLEM
V. A. Baraboy *In its* Cybernetic Systems and Biol. 28 Aug. 1970 p 13–23 refs (see N70-39310 22-05)
Avail: NTIS

The development of biology, in particular genetics, molecular biology, virology, radiobiology, ecology, space biology, biochemistry, and biophysics, disproves the theory of autogenesis and its opposite point of view. All living organisms are composed of the same material as the inorganic world. The basic difference which distinguishes living matter lies in its system of organization. As evoluation advances, there is intensification of both the quantitative and qualitative influence of life upon its environment, and also on the character of the links and the interaction of organisms with their environment. But the dependence of organisms upon the concrete conditons of existence diminishes with increase in their degree of organization. Consequently, organic evolution in its most general form can be regarded the process of gradual liberation of living systems from the domination of the environment. Author

N70-39313# Arizona Univ., Tucson. Coll. of Engineering.
PROCEEDINGS OF AIR POLLUTION CONTROL SEMINAR
13 Feb. 1970 166 p refs Conf. held at Tucson, Ariz., 13 Feb. 1970 *Its* EES Ser. No. 28
(Rept-60-70-28-600) Avail: NTIS

CONTENTS:

1. TOWARD A CLEANER ENVIRONMENT J. E. Blough (GM Desert Proving Ground, Mesa, Ariz.) p 4–11 (See N70-39314 22-04)

2. THE FUTURE OF VEHICULAR POWER PLANTS E. S. Starkman (Calif. Univ., Berkeley) p 12–52 refs (See N70-39315 22-28)

3. AIR POLLUTION AND HEALTH B. Burrows p 53–76 (See N70-39316 22-04)

LEGISLATIVE PULSE REGARDING AIR POLLUTION K. Cardella p 77–90 (See N70-39317 22-34)

5. METEOROLOGICAL FACTORS AFFECTING AIR POLLUTION B. M. Herman p 91–100 (See N70-39318 22-20)

6. WITH CURRENT TECHNOLOGY CAN COPPER SMELTERS MEET PROPOSED AIR QUALITY STANDARDS? J. E. Foard (Kennecott Copper Corp.) p 101–127 refs (See N70-39319 22-06)

7. AIR POLLUTION, URBAN GROWTH, AND ASTRONOMY G. W. Lockwood p 128–141 refs (See N70-39320 22-04)

8. ARE ARIZONA'S AIR POLLUTION CONTROL LAWS ADEQUATE? N. E. Schell (Ariz. State Dept. of Health) p 142–153 (See N70-39321 22-04)

9. TECHNOLOGICAL AND ECONOMIC LIMITS OF SMOKE CONTROL W. P. Goss (Magma Copper Co.) p 154–161 (See N70-39322 22-06)

N70-39314# General Motors Desert Proving Ground, Mesa, Ariz.
TOWARD A CLEANER ENVIRONMENT
John E. Blough *In* Ariz. Univ. Proc. of Air Pollution Control Seminar 13 Feb. 1970 p 4–11 (See N70-39313 22-04)
Avail: NTIS

Progress is reported on efforts to eliminate the automobile as a cause of smog, with examples in the Los Angeles area. It is stated that emission controls on new cars are substantially reducing hydrocarbon output. Potential gains which may be realized from reductions in gasoline volatility, removal of tetraethyl lead from automobile gasoline, engine maintenance, and crankcase control devices are suggested. Research and development efforts to reduce carbon monoxide and nitrogen oxide emissions are mentioned. P.A.B.

N70-39316# Arizona Univ., Tucson. Coll. of Medicine.
AIR POLLUTION AND HEALTH
Benjamin Burrows *In its* Proc. of Air Pollution Control Seminar 13 Feb. 1970 p 53–76 (See N70-39313 22-04)
Avail: NTIS

The chronic and acute effects of air pollution on health are discussed. It is stated that, although meaningful figures are unobtainable, there is no harmless level of air pollution; consequently, all pollution producers should be required to reduce their air contamination to the lowest possible level compatible with their operations. P.A.B.

N70-39320# Kitt Peak National Observatory, Tucson, Ariz.
AIR POLLUTION, URBAN GROWTH, AND ASTRONOMY
G. W. Lickwood *In* Ariz. Univ. Proc. of Air Pollution Control Seminar 13 Feb. 1970 p 128–141 refs (See N70-39313 22-04)
Avail: NTIS

The effects of air pollution and city lights on ground based astronomy are investigated. A study of observing conditions at Kitt Peak National Observatory for the decade 1960 to 1969 is described, and median annual extinction coefficients for both UBV and uvby photometry systems are presented. The constributions of the copper industry to sulphur dioxide pollution and of transportation to carbon monoxide pollution are discussed with special regard to the failures of business, the public, and government to solve the problem. Author

N70-39321# Arizona State Dept. of Health, Phoenix. Air Pollution Control Div.
ARE ARIZONA'S AIR POLLUTION CONTROL LAWS ADEQUATE?
N. E. Schell *In* Ariz. Univ. Proc. of Air Pollution Control Seminar 13 Feb. 1970 p 142–153 (See N70-39313 22-04)
Avail: NTIS

The provisions deemed necessary to the control of air pollution are outlined and used in evaluating the law in Arizona. Deficiencies in the current air pollution definition are discussed. Limited aspects of the present law are mentioned with regard to open burning restrictions, vehicle performance standards, agricultural exemptions, guidelines for emergency actions, penalties for misdeameanors, permits, and variance procedures. P.A.B.

N70-39329# Addis Translations International, Woodside, Calif.
CHROMOSOME ANOMALIES IN PERSONS WORKING UNDER CONDITIONS OF EXPOSURE TO IONIZING RADIATION
St. Zhivkov et al Jan. 1970 24 p refs Transl. into ENGLISH from Suvremenna Med. (Sofia), v. 19, no. 5, 1968 p 455–452 Prepared for Calif. Univ., Livermore. Lawrence Radiation Lab.
(UCRL-Trans-10442) Avail: NTIS

Structural and numerical chromosomal abnormalities were found in cultured leucocytes from 34% of the person tested who had worked for two years under conditions of exposure to ionizing radiation and had received a mean annual dose of 17 to 682 millirads. The results indicate that small doses of ionizing radiation can produce chromosomal changes in human somatic cells. Author (NSA)

N70-39339*# Translation Consultants, Ltd., Arlington, Va.
CERTAIN LAWS OF CHANGE IN BRAIN ALBUMINS DURING PHYLOGENY AND ONTOGENY [O NEKOTORYKH ZAKONOMERNOSTYAKH IZMENENIY BELKOV MOZGA V FILO- I ONTOGENEZE]
Z. D. Pigareva et al Washington NASA Sep. 1970 14 p refs Transl. into ENGLISH from the publ. 'Abiogenez i Nachalnyye Stadii Evolyutsii Zhizni' Moscow, Nauka Press, 1968 p 159–168 (Contract NASw-2038)
(NASA-TT-F-13193) Avail: NTIS CSCL 06C

Certain laws of change in brain albumins during phylogenic and ontogenic processes are discussed and properties of the albumins of specific cerebral structures are studied. Author

N70-39343# Hebrew Univ., Jerusalem (Israel). Dept. of Physical Chemistry.
THE ACTION OF RADIATIONS ON SOME BIOLOGICAL MODEL SYSTEMS Technical Progress Report, 1966–1969
Gabriel Stein 12 Sep. 1969 21 p refs
(Contract AT(30-1)-3242)
(NYO-3242-34) Avail: NTIS

Using an aqueous solution of sodium salicylate as the model system, a study was made of the theoretical treatment of light emission under ionizing radiation. Comparisons were made between fluorescence induced by ultraviolet radiation and that induced by ionizing radiation. An experimental and theoretical nuclear magnetic resonance study of the sodium salicylate aqueous system was undertaken to substantiate the assumption of dimerization. The effects of steady state X irradiation of light emission were investigated. Effects of ionizing radiation on excitation processes in organic systems were studied using isomerization of stilbene in solvents, such as benzene, as an indicator of excited state formation. Studies on the role of free radicals in the radiation chemistry of biochemical and biological model systems included a detailed investigation of the specific mechanisms involved in the action of hydrogen atoms. Other studies were conducted on effects of ionizing radiation on gel systems. NSA

N70-39358# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Radiology.
VISUAL RESPONSE OF THE INTERPRETER
E. C. Gregg [1969] 19 p refs Presented at the 1st Bien. Conf. on Quant. Organ Visualization in Nucl. Med., Miami, Fla.
(Contract W-31-109-eng-78; Grants NIH AM-06760; NIH CA-08034)
(COO-78-225; CONF-700516-2) Avail: NTIS

The factors influencing visual perception by the human eye are discussed in relation to the perception of abnormalities in radiographs and radioisotope scans examined visually. Optical manipulations to improve contrast enhancement during visual presentations are discussed. NSA

N70-39416*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PLANETARY QUARANTINE AND BACK CONTAMINATION
In its Res. and Advanced Develop. 31 Aug. 1970 p 211–238 (See N70-39411 22-34)
Avail: NTIS CSCL 06M

Developed are necessary information and procedures that will permit the successful application of cleaning and decontamination processes to space hardware. Success will be evaluated in terms of bactericidal and sporicidal activity and compatibility with typical spacecraft materials. Determined are the effects upon process efficiency of varying the process parameters: (1) temperature; (2) relative humidity; (3) ethylene oxide concentration; (4) pressure; (5) carrier gases; and (6) duration of prehumidification phase. The effects of gas flow volume and velocity during all phases of the cycle are being evaluated and tests are being carried out on inoculated test pieces that simulate flight hardware. Author

N70-39422*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FILM BOILING TRANSITION TEMPERATURE FOR TISSUE COOLED WITH LIQUID NITROGEN
Robert C. Hendricks [1970] 7 p refs Proposed for presentation at Winter Ann. Meeting of the ASME, New York, 20 Nov.-3 Dec. 1970
(NASA-TM-X-52878) Avail: NTIS CSCL 06E

A series of tests were undertaken to determine the film boiling transition temperature (T sub DFB) of in-vitro pigskin using liquid nitrogen as the coolant. No unique value was found; however for the horizontal minimum disturbance system T sub DFB $\times$ 243 K and for irregular surface topology T sub DFB ranged from 260 to 275 K. Lesions and surface particles were found to cause immediate transition followed by high cooling rates. Lesions for particles can be used for controlled cooling in varying geometric patterns. Contouring and surface masking using plastics and metals can also be used to control cooling rates. In-vivo experiments on fingers were in close agreement with the in-vitro tests on pigskin. No deep freezing was permitted. Author

N70-39460# Strangeways Research Lab., Cambridge (England).
THE STRANGEWAYS RESEARCH LABORATORY, 1968
1968 64 p refs
(NP-18090) Avail: AEC Depository Libraries

Research in radiobiology consisted of studies on the effects of antiserum on Chinese hamster fibroblasts, its influence on sensitivity of cells to X radiation, and changes in X-radiosensitivity of the developing rat eye. Other studies are reported on the cell surface of erythrocytes, lymphoid cells and macrophages, biochemistry of connective tissue, developmental biology and histology, reproductive physiology, pathology, and cancer. NSA

N70-39484# Joint Publications Research Service, Washington, D.C.
EFFECTS OF MICROWAVE IRRADIATION
25 Aug. 1970 10 p refs Transl. into ENGLISH from Gigena Truda i Prof. Zabolevaniya (Moscow), no. 7, 1970 p 24–27; 51–52
(JPRS-51238) Avail: NTIS

CONTENTS:

1. DEVELOPMENT AND CLINICAL COURSE OF CARDIOVASCULAR CHANGES AFTER CHRONIC EXPOSURE TO MICROWAVE IRRADIATION K. V. Glotova et al p 1–5 refs (See N70-39485 22-04)

2. CHANGE IN THYROID FUNCTION AFTER CHRONIC EXPOSURE TO MICROWAVE IRRADIATION N. A. Dyachenko p 6–8 refs (See N70-39486 22-04)

N70-39485# Joint Publications Research Service, Washington, D.C.
DEVELOPMENT AND CLINICAL COURSE OF CARDOVASCULAR CHANGES AFTER CHRONIC EXPOSURE TO MICROWAVE IRRADIATION
K. V. Glotova et al *In its* Effects of Microwave Irradiation 25 Aug. 1970 p 1–5 refs (See N70-39484 22-04)
Avail: NTIS

The nature, severity, and clinical course of cardivascular changes are described during low intensity microwave irradiation. Neurological changes, hypotension, and bradycardia were found to occur most often. Results of dynamic observations of patients are presented in tabular form. J.A.M.

N70-39486# Joint Publications Research Service, Washington, D.C.
CHANGE IN THYROID FUNCTION AFTER CHRONIC EXPOSURE TO MICROWAVE IRRADIATION
N. A. Dyachenko *In its* Effects of Microwave Irradiation 25 Aug. 1970 p 6–8 refs (See N70-39484 22-04)
Avail: NTIS

A thyroid study using I 131 was performed in humans systematically exposed to microwaves in the 1 cm range. Duration of exposure was 3.5 hours per week. The amount of absorbed I 131 was determined 2, 4, and 24 hours after ingestion using gamma ray intensity measurement near the isthmus; basal metabolism was also determined. Numerical studies showed that microwave radiation impairs the correlations of nervous processes and diencephalic regulation in organs and tissues. J.A.M.

N70-39493 International Business Machines Corp., Oswego, N.Y.
TECHNIQUES FOR DEVELOPING OPTIMUM MAN/COMPUTER RELATIONSHIPS IN AEROSPACE AVIONICS SYSTEMS
W. M. Gaddes *In* AGARD Air and Spaceborne Computers Apr. 1970 p 57–72 refs (See N70-39489 22-08)
Copyright. Avail: Technivision, Braywick House, Maidenhead, Berks., Engl. US Distributor: Circa Publications, Inc., 415 Fifth Ave., Pelham, N.Y. 10803 (Attn. Mr. A. L. Candido)

Limitations in the man/computer interface reflect the lack of analysis and testing during the design phase which insure that the use of man in the system as a decision maker is enhanced and his contribution to system effectiveness is optimized. A method is described for insuring that appropriate functions are assigned to the man and that the man/computer interface design provides the necessary and sufficient information and control response for optimum man/computer communication. Author

N70-39494 Elliott Bros., Ltd., London (England).
NEW COMPUTING DEVICES AND SPECIAL AIDS
P. B. Rayner *In* AGARD Air and Spaceborne Computers Apr. 1970 p 73–86 (See N70-39489 22-08)
Copyright. Avail: Technivision, Braywick House, Maidenhead, Berks., Engl. US Distributor: Circa Publications, Inc., 415 Fifth Ave., Pelham, N.Y. 10803 (Attn. Mr. A. L. Candido)

Some of the methods of interfacing with the computer, transmitting data, and displaying it to the crew are examined, along with an example where special computing methods were locally used to produce overall improved system performance. In an airborne application there are four main types of display which must be considered: head-up displays; horizontal situation displays, including projected map systems; CRT data displays; and other numeric and pointer displays. The application and development of each of these types of display is discussed. Current work in the field of technology development is considered in relation to an integrated approach to avionic displays. Author

N70-39518*# Translation Consultants, Ltd., Arlington, Va.
MATHEMATICAL METHODS FOR STUDYING CARDIAC AUTOMATISM AND THEIR APPLICATION TO SPACE MEDICINE [MATEMATICHESKIYE METODY OTSENKI SERDECHNOGO AVTOMATIZMA I IKH PRIMENENIYE V KOSMICHESKOY MEDITSINE]
O. G. Gazenko et al Washington NASA Sep. 1970 12 p refs Transl. into ENGLISH from the publ. "Problemy Vychislitelnoy Diagnostiki" Leningrad, Nauka Press, 1969 p 7–15
(Contract NASw-2038)
(NASA-TT-F-13218) Avail: NTIS CSCL 06P

Results show that the methods provide criteria which may be important in checking the condition of cosmonauts during space flights. The criteria can be used to work out algorithms for automatic medical control according to data from a small number of the most common methods used in obtaining physiological information during the flight. Author

N70-39541*# University of Southern Calif., Los Angeles. Electronic Sciences Lab.
RESEARCH ON NEW TECHNIQUES FOR THE ANALYSIS OF MANUAL CONTROL SYSTEMS Progress Report, 15 Jun. 1969–15 Jun. 1970
George A. Bekey and Anil V. Phatak 15 Jun. 1969 30 p refs
(Grant NGR-05-018-022)
(NASA-CR-113592; USCEE-394; PR-9) Avail: NTIS CSCL 05H

The application of statistical decision theory to the subject of manual adaptive control is reported. Application of the results to particular control situations by computer simulations is considered. Research on the modeling of neuromuscular systems and study of human eye movements during fixation on a steady target are discussed, with possible application in formulating mathematical models of human controllers. R.B.

N70-39547# Naval Air Development Center, Johnsville, Pa. Aerospace Medical Research Dept.
RENAL HEMODYNAMIC RESPONSE OF UNANESTHETIZED DOGS TO POSITIVE ACCELERATION
John E. Chimoskey 29 Dec. 1969 39 p refs
(AD-708379; NADC-MR-6905) Avail: NTIS CSCL 6/19

Trained unanesthetized dogs were exposed to positive centrifugal accelerations up to +6Gz. Renal arterial pressure and inferior vena cava pressure at kidney level were measured through indwelling catheters. Renal blood flow velocity was measured by a Doppler principle ultrasonic flow meter. The flow signal was telemetered and the pressure signals were transferred by slip rings from the centrifuge. About 10 days after the sensing devices were implanted, under pentobarbital anesthesia, the experiments began for which the dogs were unanesthetized. The mean pre-acceleration mean renal arterial pressure, arterial-venous pressure gradient, and flow velocity were respectively 140 plus or minus 2 (S.E.) mm Hg, 133 plus or minus 2 mm Hg and 27 plus or minus .4 cm/sec. Renal flow velocity decreased in proportion to plus Gz to a minimum of 4.5 plus or minus .8 cm/sec during +6Gz. Mean renal arterial pressure rose at all G levels to 160-170 mm Hg. The pressure gradient was stable up to +3Gz, and decreased at +4, 5, and 6Gz to 76 plus or minus 7 mm Hg during 06Gz. Intrarenal phenoxybenzamine, 150 micro gm/min x 30 min, which did not alter pre-acceleration renal arterial pressure and blood flow velocity, partially inhibited the flow velocity reduction during +Gz. Intrarenal vasoconstriction mediated by alpha adrenergic receptors is part of the response to +Gz. Author (TAB)

N70-39620# Forschungsinstitut fuer Militaerische Bautechnik, Zurich (Switzerland).
RADIATION PROTECTION OF THE PUBLIC IN A NUCLEAR

CATASTROPHE
S. Pretre and H. Brunner May 1969 101 p refs In GERMAN
(EMB-69-7) Avail: AEC Depository Libraries

Surface explosions of nuclear weapons were assumed to occur either accidentally or intentionally outside the borders of Switzerland. Fallout effects on the Swiss population were discussed. Four main areas were covered: properties of radioactive particles, dispersion of particles by wind, protective measures, and radiosensitivity of man. Some of the conclusions of the conference are as follows: local fallout particles are too large to present an inhalation problem, eliminating the need for gas masks. The major danger is represented by external radiation necessitating stay in fallout shelters for at least two weeks; radioactive strontium poses a smaller internal radiation hazard than previously assumed; radioactive iodine isotopes, on the other hand, are more hazardous than expected, especially to children. Problems of the recovery phase are discussed. NSA

N70-39646*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
HUMAN FACTORS SYSTEMS SRT
In its Res. and Advanced Devel., Vol. 2 15 Feb. 1970 p 463–468 (See N70-39642 22-34)
Copyright. Avail: NTIS HC $10.00/MF $0.65

Man-machine concepts required for remote control of unmanned planetary and lunar roving vehicles are discussed. Requirements and techniques for integrating man-machine functions into the control system are investigated, and the acquired knowledge is applied to laboratory studies and projects. Author

N70-39661# Washington State Univ., Pullman.
BEHAVIORAL ASSESSMENT OF VISUAL FUNCTIONING IMMEDIATELY AFTER EXPOSURE OF THE EYE TO A LASER
Ernest S. Graham (ARL), Donald N. Farrer (ARL), Roger G. Mark (AFWL), and Thomas A. Fields Holloman AFB, N. Mex. ARL May 1970 21 p refs
(Contract F29600-69-C-0007)
(AD-707871; ARL-TR-70-9) Avail: NTIS CSCL 6/19

A behavorial program is described which permits assessment of visual functioning in rhesus monkeys immediately following laser- induced foveal impairment. Six rhesus monkeys were trained on a visual discrimination problem involving Landolt rings. Subjects received stimuli via viewing tubes to either the right or left eye on a random basis. An equal number of stimuli were presented to each eye. Midway through the behavioral program the right eye was exposed to a neodymium laser. Post-exposure behavioral testing began immediately thereafter. The behavioral data predicted the occurrence of foveal impairment as verified by fundus photographs taken approximately 1 hour after exposure. Author (TAB)

N70-39672# California Univ., La Jolla.
A CONTINUED STUDY OF THE DEEP CIRCULATION AND DEEP FISH POPULATIONS IN THE PACIFIC OCEAN
John D. Isaacs and Richard A. Schwartzlose 4 May 1970 18 p refs
(Contract AT(11-1)-34)
(UCSD-34-P-127-7) Avail: NTIS

Deep photographs and current measurements were taken to contribute to the understanding of the deep near-bottom ocean environment. Previously the abyssal bottom and near bottom were thought to be nearly devoid of fish life and the steady currents to be only to a few mm/sec at the absolute maximum. The photographs have shown active abyssal life to be most plentiful, even at abyssal depths, and the steady currents to be several cm/sec, with tidal and transient currents much higher. A few motion pictures down to 1000 m were made with a newly-developed camera. These photographs show that the most abundant fish to 1000 meters off California and Baja California are the hag fish. The current measurements and the deep fish studies are becoming vital in discussions concerning disposal and pollution near the bottom on the continental shelf and at abyssal depths (for example, war gases), and have been employed by other investigators in examination of potential new fisheries. Author (NSA)

N70-39676# Michigan State Univ., East Lansing. Computer Inst. for Social Science Research.
A RANDOM-WALK MODEL FOR UELATIVE CONFLICT
E. Alan Hartman and James L. Phillips 15 Jun. 1970 63 p refs
(Contract F44620-69-C-0114)
(AD-707880; AFOSR-70-1001TR; Rept-69-2) Avail: NTIS CSCL 5/10

A single parameter model was proposed to account for the interpersonal process in a triadic conflict situation. The parameter is the estimated probability of a player attacking the stronger of his two attack choices. The model was tested on data that had been collected previously. The points of bad fit were pinpointed and an explanation given. Changes in the experimental procedure were proposed and a more complete test of the model was outlined. Author (TAB)

N70-39689# Technische Hochschule Darmstadt (West Germany).
CONCERNING THE PERCEPTION OF VARIOUS LIGHT FLASHES WITH VARYING SURROUNDINGS LUMINANCES
Hans Joachim Schmidt Clausen (Ph.D. Thesis) 1970 182 p refs
(PB-191361) Avail: NTIS CSCL 06O

The problem dealt with in the present work is that of determining the effective luminance of a flashing light in relation to a constantly burning signal light. The influence of the following factors is investigaged: signal color, viewing angle, surroundings-adaptation luminance, pulse shape, and exposure time. The criterion chosen for study was the achromatic and chromatic threshold luminance. Author (USGRDR)

N70-39716* National Aeronautics and Space Administration. Washington, D.C.
NASA SAFETY MANUAL. VOLUME 1: BASIC SAFETY REQUIREMENTS
Jul. 1969 92 p refs Supersedes NHB-1700.1
(NASA-TM-X-66319; NHB-1700.1(V1); NHB-1700.1) Avail: NASA Scientific and Technical Information Div., Washington, D.C. CSCL 13L

The basic requirements are presented for system, industrial, aviation, and public safety. System safety concerns itself primarily with safety aspects of aerospace flight hardware, whether for manned or automated space systems. Astronaut safety is an important aspect of system safety. System safety is to be emphasized throughout the life cycle of these systems, from inception through end use. Industrial safety involves the safety of personnel and property in day-by-day operations, not only within facilities, but in the transportation of people and things. There exists a strong relationship with industrial hygiene activities, and with the system safety aspects of many fabrication, transport, and test activities. Aviation safety is intended to assure adequacy of safety in the NASA aviation activities of R and D, proficiency, program support, and administrative flying. Public safety activities are aimed at protection of the general public and public property from the harmful effects of NASA operations. Author

N70-39735# American Foundation for the Blind, New York.
IEEE TRANSACTIONS ON MAN-MACHINE SYSTEMS Final Report

William R. Ferrell, ed. Mar. 1970 128 p refs Proc. of Tactile Display Conf., Menlo Park, Calif., 3-4 Apr. 1969 *Its* Vol. MMS-11, No. 1
(Grant AF-AFOSR-1728-69)
(AD-708164; AFOSR-70-1659TR) Avail: NTIS CSCL 5/8

A conference on tactile displays was held at Stanford Research Institute, Menlo Park, California, during April 3-4, 1969. A major objective of this conference was to examine current neurophysiological and psychological theories to determine the extent that a rational basis for the design of dynamic tactile displays could be developed. There were about fifty attendees at this conference and 26 papers were presented on topics ranging from neurophysiology to psychology to engineering applications. This special issue consists of reviewed papers derived from selected presentations at this conference plus the addition of several related papers that were submitted after the conference. This conference differed from other recent conferences on the sense of tough primarily in its concern for engineering and applications. This special issue mirrors the divergent aspects of the conference by presenting papers ranging from basic science to engineering applications. Author (TAB)

N70-39777# Naval Air Development Center, Johnsville, Pa. Aerospace Medical Research Dept.
PROSTAGLANDIN INDUCE, STRESS RELATED, PHOSPHOLIPID CHANGES IN THE RAT
B. David Polis, R. Paul Miller, Anna Marie Pakoskey, H. P. Schwarz, and Edith Polis 10 Jun. 1970 32 p refs
(AD-708381; NADC-MR-7006) Avail: NTIS CSCL 6/19

The injection of the prostaglandin isomers (PGE1, PGF1-alpha, PGB1, and PGBx) into rats caused changes in plasma and brain phosphatidyl glycerol and related phospholipids that mimic the changes found in accelerated rats and in the plasma of physically or psychially stressed humans. The prostaglandin effects on normal rat plasma phospholipids were abolished in the hyprophysectomized rat. A similar block in phospholipid change was observed in hypophysectomized rats subjected to acceleration stress. All four prostaglandin isomers caused significant increases in plasma and brain phosphatidyl glycerol. Differences were observed in the effects on other phospholipids. Thus PGE1 decreased the total plasma phospholipid and phosphatidyl choline levels while PGF1-alpha increased both levels. PGE1 caused severe symptoms of lassitude and diarrhea in both normal and hypophysectomized rats. These effects were absent with the other prostaglandin isomers. In contrast, PGBx appeared to enhance the state of well being and lively behavior of the rat. These results, in conjunction with previous work on phospholipids in stress, implicate the prostaglandins in an adaptive response to stress which involves the mobilization of energy yielding molecular components and a gearing of metabolic events for survival. Author (TAB)

N70-39804# Central Research Inst. for Physics, Budapest (Hungary).
INVESTIGATION OF Zr-T AEROSOL
I. Feher and J. Biro 1970 12 p refs
(KFKI-70-9) Avail: AEC Depository Libraries

The tritium incorporation hazard presented by detached solid particles for zirconium-tritium targets for production of 14-MeV neutrons was studied. The aerosol parameters of the particles detached from the zirconium-tritium targets were studied and the inhalation hazard was evaluated from personnel and area contamination monitoring data. NSA

N70-39842# Stanford Univ., Calif. Dept. of Computer Science.
AN INFORMATION PROCESSING MODEL OF INTERMEDIATE-LEVEL COGNITION
Joseph D. Becker May 1970 137 p refs
(Contract ARPA SD-183)
(AD-708082; SU-AIM-119) Avail: NTIS CSCL 6/4

The report describes a formal information-processing model of an Intermediate-Level cognitive system. The model includes memory structures for the storage of experience, and processes for responding to new events on the basis of previous experience. In addition, the proposed system contains a large number of mechanisms for making the response-selection process highly efficient, in spite of the vast amount of stored information that the system must cope with. These devices include procedures for heuristically evaluating alternative subprocesses, for guiding the search through memory, and for reorganizing the information in memory into more efficient representations. Author (TAB)

N70-39843# Stanford Univ., Calif. Dept. of Computer Science.
MIND AND BRAIN, AGAIN
Kenneth Mark Colby 25 Mar. 1970 13 p
(Contract ARPA SD-183; Grant PHS-MH-06645-08)
(AD-708081; SU-AIM-116) Avail: NTIS CSCL 6/4

Classical mind-brain questions appear deviant through the lens of an analogy comparing mental processes with computational processes. Problems of reducibility and personal consciousness are also considered in the light of this analogy. Author (TAB)

N70-39850*# National Aeronautics and Space Administration, Washington, D.C.
VARIATIONS OF THE ACCELERATIVE FIELD IN SOME COMMON AMUSEMENTS [VARIAZIONI DEL CAMPO ACCELERATIVO IN ALCUNI SVAGHI COMUNI]
A. Scano Oct. 1970 6 p Transl. into ENGLISH from Riv. Med. Aeron. Spaziale (Rome), v. 33, no. 1, Jan.–Feb. 1970 p 133–138
(NASA-TT-F-13343) Avail: NTIS CSCL 06S

The + or – Gz accelerations connected with the motion of vehicles characteristic of amusement parks, switchbacks, and cabins of the various revolving and oscillating attractions were registered with a one component accelerograph. The tracings showed extreme values of from + 0,1 to + 3,2 Gz of a duration not exceeding one second, with variations of up to more than 60 G/sec, alternating with different positive G periods of 2 to 3 seconds each. In the rotors, great cylinders on a vertical axis rotating at 40 revolutions per minute, an approximate + 4 Gx is reached. The rarity of motion sickness in the described conditions is discussed. Author

N70-39867# Howard Univ., Washington, D.C. Dept. of Physiology.
EFFECTS OF ALTITUDE ON CELLULAR METABOLISM AND TERMINAL OXIDATION Annual Report, 15 Apr. 1969–14 Apr. 1970
Leslie C. Costello and Armand J. Gold May 1970 14 p
(Contract DAHC19-68-G-0020)
(AD-707985; Rept-2) Avail: NTIS CSCL 6/19

The report presents continuation studies of the effects of altitude exposure on energy metabolism and mitochondrial activity in rats. Exposure of rats in experimental chambers at a simulated altitude of 25000 ft. resulted in a consistent elevated plasma pyruvate. The animals under these conditions developed hypophagia, weight loss, and increased hematocrits. Isolated liver and kidney mitochondria from these animals did not exhibit any alterations in cytochrone oxidase activity, respiratory control ratio, or ADP/O ratio. However state 4 respiration of kidney mitochondria was significantly and consistently decreased in altitude animals. Author (TAB)

N70-39877# Texas Univ., Austin. Electronics Research Center.
DIGITAL TECHNIQUES FOR THE APPROXIMATE IDENTIFICATION AND SIMULATION OF THE

RESPIRATION-HEARTRATE SYSTEM
Donald R. Chick and Baxter F. Womack 1 Apr. 1970 154 p refs
(Contract F41609-68-C-0020; Grants AF-AFOSR-0766-67E; AF-AFOSR-1792-69)
(AD-708158; AFOSR-70-1375TR; TR-85) Avail: NTIS CSCL 6/2

The problem of determining a digital computer model for relating heart rate variations to respiration and other nonrandom factors is considered. The respiratory signal is a measured signal while the other nonrandom factors are unmeasurable, the sum of which is called a nonrespiratory signal. The model is derived from heart beat times and sampled values of the respiratory signal. A process is developed whereby the heart beat times are converted to a uniformly sampled heart rate signal. This allows a sampled-data model to be used to approximate the respiration-heartrate system which is assumed to be continuous. The respiratory signal is the system input and the heart rate signal is considered to be the sum of the system output, the nonrespiratory signal and noise. Several identification methods are considered for determining the parameters of the respiration-heartrate system transfer function. An on-line type identification method using instrumental variables is developed so that indefinite lengths of data may be used. Experimental data from several subjects are processed to illustrate the usefulness of the methods developed. Author (TAB)

N70-39880# Stanford Univ., Calif. Dept. of Computer Science.
STANFORD ARTIFICIAL INTELLIGENCE PROJECT
John McCarthy, Edward Felgenbaum, and Joshua Lederberg Apr. 1970 79 p refs
(Contract ARPA SD-183; Grant PHS-MH-06645-08)
(AD-708087; SU-AIM-117) Avail: NTIS CSCL 6/4

Current research is reviewed in artificial intelligence and related areas, including representation theory, mathematical theory of computation, models of cognitive processes, speech recognition, and computer vision. Author (TAB)

N70-39891# Human Resources Research Organization, Alexandria, Va.
A STUDY OF THE US COAST GUARD AVIATOR TRAINING REQUIREMENTS
Eugene R. Hall, Paul W. Caro, Jr., Oran B. Jolley, and Gilbert E. Brown, Jr. Dec. 1969 103 p refs
(Contract DOT-CG-92556A)
(AD-707677; HUMRRO-TR-69-102) Avail: NTIS CSCL 5/9

An analytical study was conducted to define desired functional characteristics of modern, synthetic flight training equipment for the purpose of producing potentially better qualified aviators through a combination of aircraft and simulator training. Relevant training which aviators receive in preparation for specific aircraft duties and training requirements for Coast Guard aviation are discussed. To meet these objectives, a comprehensive study of aviator requirements during operational missions was undertaken. The search and rescue (SAR) mission was chosen for the analysis, and missions were chosen to represent operations in each of the four aircraft used by the Coast Guard primarily for the SAR. Author (TAB)

N70-39893# Naval Personnel Research Activity, San Diego, Calif.
HUMAN FACTORS METHODS DEVELOPMENT AND TEST 2: EVALUATION OF THE AUTOMATED OPERATIONAL SEQUENCE DIAGRAM (OSD)
Orvin A. Larson and Joe E. Willis May 1970 42 p refs
(AD-707719; SRM-70-17) Avail: NTIS CSCL 5/9

The report documents an evaluation of an automated version of the operational sequence diagram (OSD) for use in personnel research. Automation of the OSD herein refers to the use of alphanumeric characters to replace geometric symbols and the use of non-computerized automatic data processing (ADP) methods to produce the OSD. In-house personnel researchers were surveyed to determine the current usage of OSDs and the user perceived strengths and weaknesses of OSDs for personnel research. Three variations of a basic automated OSD were developed and evaluated. Two of the automated OSD formats were evaluated by application to Navy weapon and support systems which were under development. Author (TAB)

N70-39917# Naval Air Development Center, Johnsville, Pa.
A CARDIOVASCULAR DYNAMIC RESPONSE INDEX
Richard J. Crosbie, Carl T. Reichwein, and Emma Fessenden 26 Jun. 1970 17 p refs
(AD-708383; NADC-MR-7010) Avail: NTIS CSCL 6/19

Human tolerances to accelerating forces long have been recognized as being dependent on the magnitude, direction, and duration of a given G. Experimentally derived tolerance curves for positive G have been reported by Stoll and Kydd. The former provides the time (time at peak pulse rise time) at which a given end-point (PLL) will occur for various sustained G levels while the latter provides the period of haversine shaped G profile which will produce the same end-point for various peak Gs. Aerodynamically derived G profiles take on a wide variety of shapes and forms. Using a lumped parameter description for both the arterial and venous portions of the cardiovascular system, a simplified mathematical model has been derived which includes a feedback loop for changes in cardiac output and peripheral vascular resistance to represent the non-linear effects of cardiovascular reflexes. The model, which describes the transient and steady state response of the system to any shaped G profile, has been programmed on an analog computer. By identifying a particular response of the system to correspond with a given endpoint (PLL), a cardiovascular dynamic response index (CDRI) HAS BEEN DEFINED5 By using the CDRI, the model provides agreement with both the Stoll and Kydd tolerance curves. Author (TAB)

N70-39921# Naval Air Development Center, Johnsville, Pa. Aerospace Medical Research Dept.
CORONARY BLOOD FLOW AND ELECTROCARDIOGRAM DURING HEADWARD ACCELERATION IN UNANESTHETIZED DOGS
John E. Chimosley 9 Jun. 1970 15 p refs
(AD-708380; NADC-MR-7005; Rept-15) Avail: NTIS CSCL 6/19

Trained unanesthetized dogs were exposed to brief, 10-second, positive acceleration on the 8-foot animal centrifuge at the Naval Air Development Center, Warminster, Pa. Both the amplitude of the T-wave of the left ventricular surface electrocardiogram and left circumflex coronary artery blood flow velocity decreased during headward acceleration. Post acceleration hyperemia occurred as T-wave amplitude returned to normal. Author (TAB)

N70-39922* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
RESUSCITATION APPARATUS Patent
Laurence M. Christman, inventor (to NASA) Issued 18 Jan. 1966 (Filed 1 May 1963) 8 p Cl. 128-29
(NASA-Case-XMS-01115; US-Patent-3,229,689; US-Patent-Appl-SN-277404) Avail: US Patent Office CSCL 06K

A method and apparatus for delivering oxygen intrapulmonically, with minimum danger to the subject by even an inexpert operator, is described. With the intermittent application of positive pressure, a gaseous mixture comprising over 94.5% oxygen and from 2.7 to 4% carbon dioxide is delivered intrapulmonically to the subject on an intermittent basis. The selection and control of the positive pressure is adjustable as desired and in correspondence with the subject's physical needs. The apparatus includes a soft rubber oro-pharyngeal tube or airway which is adapted for insertion

into the throat of the subject so that oxygen may be delivered directly to the trachea and lungs. Other parts of the apparatus include a conventional oxygen supply cylinder, an adjustable pressure regulator, and a pressure breathing mask interposed in the oxygen supply line from the regulator. P.A.B.

N70-39923*# Technology, Inc., San Antonio, Tex. Life Sciences Div.
MODIFICATION OF THE PHYSICAL PROPERTIES OF FREEZE-DRIED RICE Patent Application
Clayton S. Huber, inventor (to NASA) Filed 28 Aug. 1970 9 p
(Contract NAS9-8927)
(NASA-Case-MSC-13540-1; US-Patent-Appl-SN-68023) Avail: NTIS CSCL 06H

The method steps include first cooking rice over a low simmering heat until it is tender and edible. Then it is frozen and thawed for two complete cycles. Thereafter, the rice is again frozen and freeze dried in a vacuum sufficient to remove water from the rice by sublimation. Rehydration is accomplished by placing the rice in water at an elevated temperature and normally requires only a minute or so. The cycle of first freezing and then thawing appears to change grain porosity and permits easy and rapid sublimation of the water vapor. NASA

N70-39938# Florida State Univ., Tallahassee. Computer-Assisted Instruction Center.
COMPUTER-ASSISTED INSTRUCTION IN ENGINEERING DYNAMICS
John W. Sheldon 30 May 1970 21 p refs Its CAI Systems Memo No. 18
(Contract N00014-68-A-0494)
(AD-707702) Avail: NTIS CSCL 5/9

The Florida State University School of Engineering Science, in cooperation with the Computer-Assisted Instruction Center, provided 29 undergraduate students with a ninety-minute CAI unit course, supplemented by a one-hour class lecture, on the dynamic nature of three dimensional rotations and Euler angles. The area of Euler angles was selected because, despite its essentiality in problem working in three-dimensional rotations of a rigid body, it has been a stumbling block to students in dynamics. Euler angles are difficult to visualize and have mathematical properties which are unfamiliar to most undergraduates. Utilizing graphic presentations and branching capabilities of CAI to combat these learning difficulties, the CAI program contained three problems in ascending order of difficulty, designed to link the physical geometry of the problem situation with the vector equation derived in class lecture. Although the final problem was typical of previous homework problems, students indicated that they did not consider the question difficult. In addition, students indicated that they considered the CAI program an interesting and effective teaching aid which they would like to see further utilized. Author (TAB)

N70-39948# Washington Univ., Seattle.
MULTIPLE PREDICTION STUDIES Final Report, May 1953–Feb. 1970
Paul Horst Jun. 1970 18 p refs
(Contracts Nonr-477(08); Nonr-477(33))
(AD-708059) Avail: NTIS CSCL 5/10

The report indicates the general areas of investigation in a program of research in the prediction of personal adjustment, conducted over a period of seventeen years. The publications resulting from the research and listed in the bibliography include thirty-six (36) theses, forty-seven (47) technical reports, twenty-six (26) journal articles, eight (8) monographs, four (4) chapters in books, and four (4) books. Author (TAB)

N70-39994# Texas Univ., Austin. Electronics Research Center.
DIASTOLIC ARTERIAL BLOOD PRESSURE MEASUREMENT BY AN OCCLUSION CUFF: MICROPHONE TECHNIQUE
James E. Allred, A. J. Welch, P. C. Richardson, and F. B. Vogt
15 Jan. 1970 70 p refs
(Grant AF-AFOSR-1792-69)
(AD-708157; TR-81; AFOSR-70-0446TR) Avail: NTIS CSCL 6/12

The report describes a technique for automating the measurement of indirect systolic and diastolic blood pressure. Characteristics of the K sound are described which may provide a better criteria for detecting diastolic pressure than the disappearance of the sound. From the results of this study recommendations are made for an extensive investigation of the use of K sounds for the determination of diastolic pressure. Author (TAB)

N70-40004# Naval Training Device Center, Orlando, Fla.
PROCEEDINGS OF THE ANNUAL NAVAL TRAINING DEVICE CENTER AND INDUSTRY CONFERENCE
1969 301 p refs Conf. held at Orlando, Fla., 18-20 Nov. 1969
(AD-707757; NAVTRADEVCEN-IH-173) Avail: NTIS CSCL 5/9

A compilation of papers is presented on a variety of technical subjects relating to training device technology. The conference theme, Cost Effectiveness of Training Devices, provided a common ground for the exchange of new ideas and discussion of mutual problems. Author (TAB)

N70-40034*# Massachusetts Inst. of Tech., Cambridge. Man-Vehicle Lab.
STUDIES OF HUMAN DYNAMIC SPACE ORIENTATION USING TECHNIQUES OF CONTROL THEORY Status Report, Jul. 1969–Jun. 1970
L. R. Young and Y. T. Li Jun. 1970 55 p refs
(Grant NGL-22-009-025)
(NASA-CR-113593) Avail: NTIS CSCL 05E

Research and development is reported in the field of dynamic space orientation. Specific areas of accomplishment include: (1) display systems; (2) manual control; (3) visual systems; (4) vestibular functions; (5) cybernetics; (6) computer development and laboratory facilities; (7) medical applications; and (8) life support in unusual environments. D.L.G.

N70-40053# Stanford Univ., Calif. Dept. of Computer Science.
SOME IMPLICATIONS OF PLANARITY FOR MACHINE PERCEPTION
Gilbert Falk Dec. 1969 29 p refs
(Contract ARPA SD-183)
(AD-708085; SU-AIM-107) Avail: NTIS CSCL 6/4

The problem of determining the shape and orientation of an object based on one or more two-dimensional images is considered. For a restricted class of projections it is shown that monocular information is often nearly sufficient for complete specification of the object viewed. Author (TAB)

N70-40067# Stanford Univ., Calif. Dept. of Computer Science.
GENERALIZATION LEARNING TECHNIQUES FOR AUTOMATING THE LEARNING OF HEURISTICS
D. A. Waterman Jul. 1969 77 p refs
(Contract ARPA SD-183; ARPA Order 457)
(AD-708073; SU-AIM-102) Avail: NTIS CSCL 6/4

The paper investigates the problem of implementing machine learning of heuristics. First, a method of representing heuristics as production rules is developed which facilitates dynamic manipulation of the heuristics by the program embodying them. Second, procedures are developed which permit a problem-solving program employing heuristics in production rule form to learn to improve its performance by evaluating and modifying existing heuristics and

hypothesizing new ones, either during an explicit training process or during normal program operation. Third, the feasibility of these ideas in a complex problem-solving situation is demonstrated by using them in a program to make the bet decision in draw poker. Finally, problems which merit further investigation are discussed, including the problem of defining the task environment and the problem of adapting the system to board games. Author (TAB)

N70-40091# Oak Ridge National Lab., Tenn.
THE CALCULATION OF NEUTRON-INDUCED PHYSICAL DOSES IN HUMAN TISSUES
J. J. Ritts (M.S. Thesis), M. Solomito (M.S. Thesis), and P. N. Stevens (M.S. Thesis) 22 May 1970 108 p refs Sponsored in part by AEC and DASA
(AD-707742; ORNL-TM-2991) Avail: NTIS CSCL 6/18

The purpose of the investigation was to calculate improved multicollision neutron fluence-to-dose conversion factors by solving the combined neutron and gamma-ray transport problems in phantom models designed to represent human beings. Also, new neutron fluence-to-kerma factors and improved secondary gamma-ray yields were to be determined for the elements composing the slabs. The computer code ANISN was employed in solution of the transport equation. Multicollision neutron fluence-to-dose conversion factors were calculated for neutron sources, either beams or isotropic fluxes of energies from 15 MeV to thermal incident on a 30 cm slab with infinite or finite transverse dimensions. The curves representing the total of the neutron and gamma-ray energy deposition were found to range from approximately 6% to a factor of two lower than those previously reported. This effect is attributed primarily to the treatment of secondary gamma rays and becomes more pronounced with increasing depth. Results are presented for 38 different combinations of source and geometry and for the maximums as a function of the source energy for each set of calculations. Author (TAB)

N70-40095# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
MIXED-INITIATIVE MAN-COMPUTER INSTRUCTIONAL DIALOGUES *Final Report, 1 Feb. 1969–28 Feb. 1970*
Jaime R. Carbonell 31 May 1970 216 p refs
(Contract N00014-69-C-0233)
(AD-707782; BBN-1971) Avail: NTIS CSCL 5/9

The main purpose of the research was to show that a new type of computer-assisted instruction (CAI), in many respects more powerful than existing ones, is feasible, and to demonstrate by example some of its major capabilities. In order to do that, a set of computer programs, the SCHOLAR system, was written. Both the conception and the implementation of this system are discussed in detail. Actual on-line protocols of the usage of SCHOLAR are included. The present approach to CAI can be defined as being information-structure-oriented (ISO) because it is based on the utilization of a symbolic information network of facts, concepts, and procedures. SCHOLAR is capable to generate out of its information network the material to be presented to the student, the questions to be asked to him, and the corresponding expected answers. SCHOLAR can also utilize its information network to answer questions formulated by the student. As a consequence, SCHOLAR is capable of maintaining a mixed-initiative dialogue with the student. This dialogue takes place in a subset of English. Author (TAB)

N70-40098# Naval Submarine Medical Center, Groton, Conn. Medical Research Lab.
DECREASE IN PERCEIVED DISTORTION WITH REPEATED EXPOSURE: APPLICATION FOR NAVAL DIVER TRAINING Interim Report
Christine L. McKay 16 Feb. 1970 12 p refs
(AD-708026; SMRL-613) Avail: NTIS CSCL 6/19

With repeated exposure to a distorted visual environment an individual perceives less distortion on each subsequent occasion. This positive advantage of repeated exposure is found to transfer to a different distortion provided that the subject has not had too much experience with the first distortion. Overtraining on one distortion cancels any positive transfer of advantage from one distortion to another. It may, therefore, be possible to train divers, out of water, to perform more effectively as soon as they enter the water. Author (TAB)

N70-40100# Naval Submarine Medical Center, Groton, Conn. Medical Research Lab.
THE EFFECT OF INTERMITTENT EXPOSURE TO 3% CO2 ON RESPIRATION Interim Report
K. E. Schaefer, C. R. Carey, and J. H. Dougherty, Jr. 13 Mar. 1970 14 p refs
(AD-708030; SMRL-618) Avail: NTIS CSCL 6/19

One healthy male subject was exposed for six days, 15 hours daily, to a CO2 concentration rising from 0 - 3% CO2 at normal oxygen concentrations of 20 - 21% O2. Average data of physiological measurements made (A) prior ot and (B) at the end of the 15-hour exposure to CO2 concentration, rising linearly from 0 - 3% CO2 were pACO2(A): 40.7 mm Hg; pACO2(B): 42 mm Hg; pAO2(A): 100.7 mm Hg; pAO2(B): 114.8 mm Hg; VE(A): 6.28 L/m; VE(B): 12.09 L/m. pACO2 determined at the end of the none-hour air breathing rose from the third day on to reach, at the fifth day, a peak higher than the corresponding value following 15 hours of CO2 inhalation. During the sixth day of intermittent exposure to CO2, pAO2 on air returned to control values. This finding indicates that after three days the nine-hour period of air breathing was insufficient to eliminate the CO2 accumulated during the 15-hour period of CO2 breathing. Ventilatory response to 5% CO2 was increased during intermittent exposure to CO2 and the slope of the CO2 tolerance curve was also increased. Author (TAB)

N70-40108# General Electric Co., Philadelphia, Pa. Re-Entry and Environmental Systems Div.
CLOSED-CYCLE RESPIRATOR DEVELOPMENT PROGRAM Annual Report, Jun. 1969–Jun. 1970
John T. Keiser and Richard Bingman 24 Jun. 1970 91 p
(Contract N00014-69-C-0329)
(AD-708035; RDP-019) Avail: NTIS CSCL 6/12

A description is given of a medical respirator based on the technology of closed cycle life support systems. Four prototype units were designed, fabricated and delivered to the National Naval Medical Center, Bethesda, Maryland for laboratory and clinical evaluation. System performance requirements were selected to mee the needs of military use and the overall design was bounded by the requirement for portability and extended autonomous operation. An eleven month program starting in June, 1969, translated these requirements to prototype hardware which underwent comprehensive performance testing at the component, sub-system and system levels prior to delivery. This testing amply demonstrated the capability of the prototype systems to satisfy the performance requirements. This report summarizes the design and development efforts addressed to defining the prototype configuration and presents a complete physical description of the system. In addition, system calibration and test procedures, along with typical results, are presented. Author (TAB)

N70-40134*# National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY A Continuing Bibliography with Indexes
Aug. 1970 111 p refs
(NASA-SP-7011(79)) Avail: NTIS CSCL 06E

Subject coverage concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. Each entry consists of a standard citation accompanied by its abstract. Author

N70-40150# Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
RESEARCH ON DEEP SUBMERGENCE DIVING PHYSIOLOGY AND DECOMPRESSION TECHNOLOGY UTILIZING SWINE, EVALUATION OF SWINE AS A HYPERBARIC ANALOG TO MAN AND DETECTION OF EMBOLI BY USE OF THE ULTRASONIC DOPPLER FLOWMETER Technical Progress Report, 15 May 1969–15 May 1970
Murlin F. Gillis 6 Jul. 1970 25 p refs
(Contract N00014-69-C-0350)
(AD-708748) Avail: NTIS CSCL 6/19

Sixteen miniature swine of similar size performed 83 dry chamber air dives, using no-stage profiles with linear ascent and descent rates of 60 ft/min, depths of 60 to 180 ft, and bottom times up to 120 min. Surface intervals always exceed 48 hr. Signs considered diagnostic of bends were lameness, persisting for 15 minutes or more and relieved by recompression, and/or acute, progressive respiratory distress, and/or central neurologic signs, e.g. paralysis. Bends was not observed at 60 ft with bottom times up to 120 min; a 60% incidence was recorded for 140 ft/60 min and a 16% incidence for 180 ft/20 min. Doppler flowmeter studies have shown that individual glass microballoons of 80-150 micra diameter are easily detectable in the thoracic caudal vena cava, and that 40 micra balloons, while difficult to detect individually, are easily detected when injected in large quantities. Severe caval air embolism has been recorded following 180 ft/15 min excursions without bends signs, confirming that significant gas embolism can exist in the absence of such signs and showing the value of the Doppler flow meter for embolism detection. Author (TAB)

N70-40174# Naval Civil Engineering Lab., Port Hueneme, Calif.
SEALAB 3: DIVER'S ISOTOPIC SWIMSUIT-HEATER SYSTEM
John J. Bayles and Douglas Taylor May 1970 126 p refs
(AD-708680; NCEL-TN-1087) Avail: NTIS CSCL 6/17

The Atomic Energy Commission and the Deep Submergence Systems Project Office included the development and evaluation of an isotopic swimsuit heating system in the SEALAB III program to demonstrate a use of atomic energy as a method for providing supplemental heat to divers. The task of developing a swimsuit heating package was assigned to the Naval Civil Engineering Laboratory, Port Hueneme, California. The package utilizes AEC furnished Plutonium 238 capsules for heating water which is pumped through a closed-cycle system including a divers undergarment fitted with closely spaced plastic tubing. The diver wears a wet suit over this undergarment to aid in retaining the heat provided. The package or isotope backpack segment is designed to be attached to a modified Mark VIII mixed gas breathing apparatus backpack. The specifications based upon available information at the time of initial development stages, did not provide for sufficient isotope to produce adequate supplemental heat. However, the final backpack design did not materially affect the divers capabilities and the system was successfully tested with respect to its design operational characteristics. Author (TAB)

N70-40182# Oregon Univ., Portland. Dept. of Biochemistry.
HYPEROSMOLARITY AND ASYMMETRIC SOLUTE MOVEMENT Progress Report, 1 Sep. 1969–31 Aug. 1970
John T. Van Bruggen [1970] 12 p
(Contract AT(45-1)-1754)
(RLO-1754-20) Avail: NTIS

Progress made in elucidating various aspects of the phenomenon known as solute drag are reported. A model of double solute or cross traffic interaction is described, along with tests of the system with several membranes and a variety of solutes. The experiments appear to demonstrate that solute interaction is not a unidirectional phenomenon but is the result of the imposition and/or addition of all the physical forces operative in the system. The production of a homopore membrane, with some 10 to the minus 7th or minus 8th power holes cm to the minus 2nd power, is discussed. The hole size is measured to be approximately 300 or 350 A. Experiments with the membrane in solute interaction situations indicate that on a homoporous membrane solutes interact, and/or the process of solute drag is present, just as it was on the heteroporous membrane. P.A.B.

N70-40218# Federation of American Societies for Experimental Biology, Bethesda, Md.
EFFECT OF LIGHT CONDITIONS ON THE ANTARCTIC CONTINENT ON AUTOREGULATION IN THE HUMAN BRAIN
P. V. Bundzen [1969] 6 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 55, no. 8, 1969 p 929
(PB-189241T; NS-264) Avail: NTIS CSCL 06P

Assessed is the state of autoregulation of the brain during the South Polar night and South Polar day, constituting unaccustomed diurnal and seasonal photoperiodic conditions for inhabitants of the temperate latitudes of the USSR. It is noted that disturbances of the diurnal photoperiodicity during the polar night are combined with a marked decrease in the total intensity of illumination, which is on the average 250 times below that in the period of the polar day. Author (USGRDR)

N70-40247# Army Behavior and Systems Research Lab., Arlington, Va.
MAINTAINING TARGET DETECTION PROFICIENCY THROUGH TEAM CONSENSUS FEEDBACK
John T. Cockrell Dec. 1969 29 p
(AD-707376; BESRL-TRN-219) Avail: NTIS CSCL 5/9

The document reports on investigation of the effectiveness of team consensus feedback proficiency maintenance methods for maintaining and improving the proficiency of image interpreters--specifically, determination whether the target detection skill of individual interpreters can be improved by feedback which team members generate for themselves as they compare and discuss their work. Author (TAB)

N70-40261# Denver Univ., Colo. Dept. of Psychology.
TASK DIFFICULTY AND CHANNEL REDUNDANCY IN BISENSORY INFORMATION PROCESSING
Joseph Halpern Jul. 1970 27 p refs
(Contracts N00014-68-C-0383; N00014-67-A-0394-0001)
(AD-708675; TR-5) Avail: NTIS CSCL 6/16

Subjects were provided with either visual, auditory, or combined visual and auditory (bisensory) information. The stimuli were generated from recordings of ambient sea noises. The results showed the relation for recognition performance of the bisensory mode to either unisensory mode. Methodological factors such as task difficulty, channel redundancy, etc. were discussed as being relevant for the study of bisensory information processes. Author (TAB)

N70-40278# Denver Univ., Colo. Dept. of Psychology.
THE EFFECTS OF MOVEMENT-INDUCED NOISE AND CUES ON PERCEPTION

Joseph Halpern Jun. 1970 27 p refs
(Contract N00014-67-A-0394-0001)
(AD-708674; TR-4) Avail: NTIS CSCL 6/16

The experiment was designed to determine whether recognition performance would be improved or retarded with the use of non-static visual stimuli as opposed to static images. The stimulus objects were rocket-like projectiles, animated by an analog-digital computer. The stimuli varied across several dimensions of similarity and Ss task was to recognize the stimulus object which was presented for 1.5 sec. periods. The stimulus presentations differed as a function of speed of motion where motion was varied across two dimensions (horizontal and vertical). The Ss were paid a bonus for correct responses with the bonus decreasing as a function of the time it took to make the decision. The prime dependent measure was choice reaction time. The present results, which should be considered preliminary, suggested that performance could be improved by motion. That is, motion might possibly provide an advantageous ratio between information and interference. Author (TAB)

N70-40283# RAND Corp., Santa Monica, Calif.
A DIRECT MECHANISM FOR THE INFLUENCE OF MICROWAVE RADIATION ON NEUROELECTRIC POTENTIALS
R. J. MacGregor Jun. 1970 30 p refs
(AD-708815; P-4398) Avail: NTIS CSCL 6/16

The paper explores the idea that the electrical component of applied microwave radiation might induce transmembrane potentials in nerve cells and thereby disturb nervous function and behavior. The paper estimates the transmembrane currents and potentials induced in nerve cells by applied electrical fields and currents. Estimates are made for steady and for oscillating stimulation. The primary conclusion is that intracranial electrical fields associated with low intensity microwave irradiation may induce transmembrane potentials of tenths of millivolts (or more) and that, therefore, such externally applied fields may disturb normal nervous function through this mechanism. The paper also presents an analysis which indicates that the induced transmembrane potential should exhibit a maximum in the microwave range of electromagnetic radiation. Author (TAB)

N70-40306*# Sandia Corp., Albuquerque, N.Mex. Planetary Quarantine Dept.
PLANETARY QUARANTINE PROGRAM Quarterly Progress Report, Period Ending 31 Dec. 1969
Dec. 1969 44 p refs
(NASA Order W-12853)
(NASA-CR-113668; QR-15) Avail: NTIS CSCL 06M

Techniques for planetary quarantine and bacterial spore inactivation are discussed. Subjects presented are: (1) bacterial spore inactivation modeling, (2) thermoradiation sterilization, (3) bioburden experimentation, and (4) computerized identification scheme. Author

N70-40307*# Minnesota Univ., Minneapolis. School of Public Health.
ENVIRONMENTAL MICROBIOLOGY AS RELATED TO PLANETARY QUARANTINE Semiannual Progress Report, 1 Dec. 1968–31 May 1969
Jun. 1969 53 p refs
(Grant NGL-24-005-160)
(NASA-CR-113669; SAPR-2) Avail: NTIS CSCL 06M

Environmental microbiology as related to planetary quarantine is discussed. Subjects presented are: (1) survival of bacillus spores at temperatures below 60 degrees C, (2) survival of bacillus spores in a controlled air stream, (3) effect of humidity, location, surface finish, and separator thickness on heat destruction of bacillus spores, and (5) detection of low levels of microbial contamination on surfaces by chemical approaches. Author

N70-40316# IIT Research Inst., Chicago, Ill.
OXYGEN TOLERANCE IN ATMOSPHERES SIMULATING UNDERSEA SATURATION DIVES Final Report, 1 Apr. 1967–30 Jun. 1970
James Q. Kissane and Willis H. Riesen 26 Jun. 1970 34 p refs
(Contract N00014-67-C-0395)
(AD-707754; IITRI-L6042-12) Avail: NTIS CSCL 6/19

Studies were conducted to determine the effects of a simulated Sealab environment on selected metabolic systems in rats. The simulated Sealab environment consisted of 98.2% helium and 1.8% oxygen atmosphere maintained at 300 psi at 22C. After 24 hr exposure and rapid decompression the following observations were made. Liver and muscle mitochondrial P:O and QO2 were normally functional. Liver LDH activity was slightly decreased. Muscle and liver glycolysis rates were unaffected. Protein synthesis in liver subcellular components measured by 14C-lysine uptake was unaffected while it decreased in muscle. Liver glycogen reserves decreased 8 to 10 fold, while muscle glycogen decreased approximately 50%. Control experiments in helium atmosphere at ambient pressure and those conducted at submergence pressure at elevated temperature suggested that thermal effects of helium resulted in increased glycogen utilization. To enable rapid sampling and freezing of tissue at pressure for nucleotide analyses, two biopsy devices were developed and evaluated. The Biopsy Probe, a boring device, was found not to be satisfactory when its performance was measured in terms of liver tissue ATP values. Using the same parameter the Surgical Biopsy Device provided rapid tissue excision and freezing by cryogenic immersion. Author (TAB)

N70-40358# Oak Ridge National Lab., Tenn.
SUMMARIES FROM ORNL-4559. THE MOLECULAR ANATOMY PROGRAM (THE MAN PROGRAM) Semiannual Progress Report, 1 Sep. 1969–28 Feb. 1970
Apr. 1970 128 p refs
(Contract W-7405-eng-26)
(ORNL-4558; SAPR-2) Avail: NTIS

Tumor transplantation, Gallium-67 localization in tumor tissues, and isolation of hamster tumor cell plasma membranes are discussed as well as the surface morphology of normal and leukemic human lymphocytes. Analysis of body fluids, the chemistry of alpha-crystallin, protein sequence studies, and analysis of derivatives from sequential degradation are reported along with the molecular structure of the nucleus. GeMSAEC development and CIRCI are covered and cracking in anodized Teflon-filled coatings is mentioned. Applications of scanning electron microscopes, gel electrophoresis, chromatography, centrifugal chromatography, analytical centrifugation, microscopes, and sedimentation counting of viruses are outlined. Melanogenesis, isolation of single-stranded DNA in zonal rotors and the molecular size of mammalian DNA are also cited along with other aspects of the molecular anatomy program. J.M.

N70-40391# Hebrew Univ., Jerusalem (Israel). Dept. of Botany
A COMPUTER SIMULATION OF NATURAL PATTERN GENERATION PROCESSES Final Scientific Report, 30 Jun. 1967–31 Oct. 1969
Dan Cohen 30 Nov. 1969 48 p refs
(Grant AF-EOAR-45-67)
(AD-704132; AFOSR-70-0938TR) Avail: NTIS CSCL 6/4

Models of some natural pattern generating processes have been tested by computer simulation. The following models have been simulated with some degree of success. The generation of the pattern of the boundary of a growing mass of cells. Smooth or

lobed patterns have been generated by purely local interactions between the cells at the boundary. The generation of drainage patterns on initially smooth surfaces. The only assumption in the model is that the rate of soil erosion is the product of some power of the local water velocity and an erodobility factor which varies randomly. The simulation could reproduce fairly well river competition and capture, and the effects of the slope and the soil heterogeneity on the drainage pattern, which occur naturally. The growth and development of the patterns as effected by mutual shading. There are positive feedback relations between the growth rates of adjacent branches and plants when the rate of elongation increases monotonically with light intensity. This causes a dominance of lighted branches over shaded branches. When the rate of elongation decreases as a function of light intensity over some range, the growth rates of adjacent branches tend to be the same, and they form a smooth level boundary. Author (TAB)

N70-40393# Naval Postgraduate School, Monterey, Calif.
DYNAMIC DEPTH PERCEPTION
Lawrence Arian Rolstad (M.S. Thesis) Apr. 1970 49 p refs
(AD-709086) Avail: NTIS CSCL 5/10

A review of research in visual acuity and depth perception of moving objects disclosed differing estimates of the relation between dynamic and static vision performance. Additionally, two distinct types of responses appear in distance estimates for moving targets as well as the elapsed time estimates for partially concealed targets. The possible relation of this depth estimation error dichotomy to lateral phoria is discussed. An experiment demonstrates that the depth estimation error dichotomy, if it exists, is not related to phoria and is independent of the direction of target motion. Further evidence of the lack of correlation between dynamic and static depth perception is presented. Author (TAB)

IAA ENTRIES

A70-40576 The effect of cardioacceleration by right atrial pacing on myocardial blood flow in normal human subjects. Suzanne B. Knoebel, William C. Elliott, Paul L. McHenry (Indiana University; Marion County General Hospital, Indianapolis, Ind.), and Edward Ross. *Cardiovascular Research,* vol. 4, July 1970, p. 306-311. 24 refs. Research supported by the Herman C. Krannert Fund, the Indiana Heart Association, the American Medical Association, the Marion County Heart Association; PHS Grants No. GE-06308; No. HTS-5363; No. HE-5749.

The myocardial blood flow response (MBF), measured by a coincidence counting technique and 84RbCl, to cardioacceleration by right atrial pacing, was studied in 18 normal subjects. MBF was found to increase at approximately 130 beats/min but decreased at more rapid rates (150 beats/min). Further study will be required to resolve the problem of this narrow range of response in order to validate pacing studies in the evaluation of serial changes in coronary reserve. (Author)

A70-40577 Tachyphylaxis to angiotensin in man. Eugenie R. Lumbers and R. F. Whelan (Adelaide, University, Adelaide, Australia). *Cardiovascular Research,* vol. 4, July 1970, p. 312-318. 23 refs.

Neither angiotensin acid nor angiotensin amide infused repeatedly or continuously into the brachial artery at the elbow induced tachyphylaxis of the forearm and hand vessels. Similar results were obtained with noradrenaline and acetylcholine, whereas tachyphylaxis was readily induced to intra-arterial infusions of vasopressin. It is concluded that tachyphylaxis plays no role in the vascular response to angiotensin in normal subjects and that the reduced vascular response to angiotensin seen in patients with renovascular hypertension is not solely due to high concentrations of circulating angiotensin. (Author)

A70-40578 First derivative of ventricular pressure recorded by means of conventional cardiac catheters. Thomas J. Knopp, Shahbudin H. Rahimtoola, and H. J. C. Swan (Mayo Clinic and Mayo Foundation, Rochester, Minn.). *Cardiovascular Research,* vol. 4, July 1970, p. 398-404. 8 refs. Research supported by the Minnesota Heart Association; PHS Grant No. HE-9374.

A method of recording dp/dt by using a standard catheter system was developed after pressure pulses had been analyzed in terms of their Fourier series. A comparison between recorded dp/dt and a reference system was then made. It was concluded that practical and useful representation of the form and reasonably accurate determination of the magnitude of peak dp/dt are possible with such a system. (Author)

A70-40712 * Fungal attack on rock - Solubilization and altered infrared spectra. Melvin P. Silverman and Elaine F. Munoz (NASA, Ames Research Center, Moffett Field, Calif.). *Science,* vol. 169, Sept. 4, 1970, p. 985-987. 18 refs.

Study of the traces of metabolic activity of microorganism in the rocks and minerals of their environment. It is found that penicillium simplicissimum isolated form weathering basalt, produced citric acid when grown in a glucose-mineral salts medium with basalt, granite, granodiorite, rhyolite, andesite, peridotite, dunite. or quartzite. After 7 days' growth as much as 31% Si, 11% Al, 64% Fe, and 59% Mg in some of hte rocks were solubilized, nad a number of rocks showed altered IR absorption in the silicon-oxygen vibration region. Z.W.

A70-40737 * Anti-G suit as a therapeutic device. Ralph Pelligra, H. Ward Trueblood, Robert Mason, Alan Chambers, Hubert C. Vykukal, and Richard P. Gallant (NASA, Ames Research Center, Moffett Field; Stanford University, Stanford, Calif.). *Aerospace Medicine,* vol. 41, Aug. 1970, p. 943-945. 9 refs.

Discussion of the therapeutic use of external body pressure produced by the Air Force Anti-G Garment Cutaway in clinical practice. A case report describing the use of an Anti-G Garment to control intra-abdominal bleeding in a patient in whom surgery and other attempts to achieve hemostasis were unsuccessful, is presented. The following discussion includes a brief review of the literature, possible mechanisms of action, and considerations of other clinical conditions in which the Anti-G Garment may prove an effective therapeutic modality. O.H.

A70-40743 Response requirements and performance in a visual vigilance task. Michael J. Guralnick and Karen G. Harvey (American University, Washington, D.C.). *Psychonomic Science,* vol. 20, Aug. 25, 1970, p. 215-217. 13 refs. Research supported by the American University.

Three groups of Ss performed a visual vigilance task with either one (standard vigilance procedure), two (binary procedure), or four (rating procedure) keys available as response indicators. Data analyzed within the framework of the theory of signal detection revealed that the criterion, beta, increased for all groups but was considerably lower for the rating method group. The sensitivity parameter remained constant over time and was also found to be independent of the response requirement. Results were discussed in terms of the relationship between psychophysical procedures and vigilance tasks. (Author)

A70-40751 Effects of input and output modes on decision time. Steven W. Keele (Oregon, University, Eugene, Ore.). *Journal of Experimental Psychology,* vol. 85, Aug. 1970, p. 157-164. 23 refs. Contract No. AF 44(620)-67-C-0099.

Stimuli about which rapid decisions are made may be composed of values on single attributes or may be compounds of more than one attribute. Two experiments were performed to study the effects of stimulus composition and response assignments on decision time. In the first experiment, it was shown that for a fixed number of unitary stimuli, reducing the number of response categories into which the stimuli were mapped results in a decrease in reaction time. For compound stimuli, in contrast, such information reduction did not result in a comparable decrease in time. A memory retrieval model appears able to account for the results. The second experiment was concerned primarily with output mode. It was found that decision time was much less when a unitary response was made to a compound stimulus than when separate responses were made to the components. The latter result supported the theory that attentional limitations are due primarily to response conflict rather than inability to process stimuli simultaneously. (Author)

A70-40752 Tilt aftereffects in central and peripheral vision. Darwin Muir and Ray Over (Dalhousie University, Halifax, Canada). *Journal of Experimental Psychology,* vol. 85, Aug. 1970, p. 165-170. 17 refs.

In two experiments it was found that inspection of a tilted line in half of the visual field has no influence on subsequent judgments of the orientation of a line displayed in the opposite half. Tilt aftereffects were found, however, when the inspection and test contours coincided spatially. The magnitude and direction of these aftereffects were dependent on the tilt of the inspection stimulus, and different angular functions were obtained in central and peripheral vision. The bearing of these results on two explanations of negative aftereffects (normalization theory and neural enhancement theory) is discussed. (Author)

A70-40753 Relative effects of display mode and input function on tracking performance. Richard E. Christ and Richard R. Newton (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.). *Journal of Experimental Psychology,* vol. 85, Aug. 1970, p. 237-244. 11 refs. Contract No. AF 44(620)-68-C-0020.

Groups of 24 Ss each were trained on one of four tracking conditions resulting from the combination of two repeating input functions, step and ramp, and two display modes, pursuit and compensatory. After 4 days of training, tracking conditions were interchanged between subgroups of Ss. Performance during both training and transfer was better for pursuit tracking than for compensatory tracking, and for the ramp function relative to the step function. Most importantly, however, cues derived both from a constant input function and from a constant display mode were shown to be effectively transferred. The results are discussed in terms of the differential roles of visual and proprioceptive cues and in terms of motor control theory. (Author)

A70-40761 Nomographic determination of safety factor for protection of eye against laser radiation. V. V. Rampal and G. R. Prasad (Instruments Research and Development Establishment, Raipur, Dehra Dun, India). *Institution of Telecommunication Engineers, Journal,* vol. 16, May 1970, p. 325-329. 8 refs.

For given parameters of laser source the estimation of factor of safety for direct viewing of the laser beam with unprotected eye at a given distance can be made by conventional nomographic techniques. One such nomograph for a pulsed ruby laser has been drawn. Importance of the knowledge of safety factor in determining the required attenuation for the design of protective glasses has been indicated. (Author)

A70-40776 Formulation of a statistical equation of motion of a viscous fluid in an anisotropic non-rigid porous solid. H. S. Lew (Arizona, University, Tucson, Ariz.) and Y. C. Fung (California, University, La Jolla, Calif.). *International Journal of Solids and Structures,* vol. 6, Oct. 1970, p. 1323-1340. 19 refs. NSF Grant No. GK-1415.

The motion of a viscous fluid through an anisotropic nonrigid porous solid is studied. The porous solid considered in this study is a solid medium involving a very dense and fine network of tubules, whose diameter is much smaller than the characteristic length of the flow system. Kinematically, such a medium should behave like a continuum, i.e., the state of deformation can be well described macroscopically. Dynamically, this type of medium has to be distinguished from the true solid continuum, because one additional body force in addition to its weight (the surface traction exerted by the viscous fluid moving through it) has to be considered in the deformation of the porous solid. Their own weight is the only body force in a true solid continuum. The equations governing the macroscopic motion of the viscous fluid through the porous medium of this type are derived by averaging the motion of the fluid through individual elements of pores over a small volume of the porous medium. The physics of the derived equations and the possible applications to the blood flow in the network of capillary blood vessels and to the motion of extracellular fluid through the network of interstitial space are discussed. (Author)

A70-40842 # Genetic studies in space (Geneticheskie issledovaniia v kosmose). Ia. L. Glembotskii. *Kosmicheskie Issledovaniia,* vol. 8, July-Aug. 1970, p. 616-627. 17 refs. In Russian.

Review of the results of studies of genetic effects of space travel performed in the USSR and U.S. over the period from 1961 to 1968. These studies were aimed at detecting the effects of space travel sources of influence - such as radiation, weightlessness, vibrations, and acceleration - on the heredity of three insect species - namely, the Drosophila fruit fly, the Tribolium confusam flour beetle, and the Habrobracon wasp - representing classical objects for genetic experiments. The reported findings include some evidence of a reinforcing action of weightlessness upon the effects of radiation. Yet, it is felt that this does not rule out the possibility that weightlessness alone may affect the structure of heredity-conditioning cells in the course of prolonged space travel. This possibility is shown to be supported by the increased incidence of translocations observed in the spermatogoniae of Drosophila fruit flies exposed to the effects of space travel in the gamma-radiation-proof compartment of Biosputnik 2. M.V.E.

A70-40850 * Serotonin, 5-hydroxyindoleacetic acid (5-HIAA), and monoamine oxidase in the bovine median eminence and pituitary gland. Ramon S. Piezzi, Frances Larin, and Richard J. Wurtman (MIT, Cambridge, Mass.). *Endocrinology,* vol. 86, June 1970, p. 1460-1462. 24 refs. PHS Grants No. AM-11237; No. AM-11709; Grant No. NGR-22-009-272.

The bovine pituitary organ and median eminence contain large amounts of serotonin, 5-hydroxyindoleacetic acid (5-HIAA), and monoamine oxidase. Highest serotonin concentrations are found in the infundibular process (i.e., the neural lobe), the infundibular stem, and the pars intermedia. 5-HIAA levels and monoamine oxidase activity are greatest in the infundibular process. (Author)

A70-40917 Acoustically evoked potentials in the rat during sleep and waking. R. D. Hall and A. A. Borbely (MIT, Cambridge, Mass.). *Experimental Brain Research,* vol. 11, no. 1, 1970, p. 93-110. 45 refs. Research supported by the Swiss National Foundation for Scientific Research; NIH Grant No. 5 PO1 GM-14940-03; Contract No. DA-28-043-AMC-02536(E).

Study of click-evoked potentials recorded from the rat's auditory cortex, medial geniculate body, reticular formation, and hippocampus during natural sleep and waking. For continuously measuring the potentials during relatively long experiments, computer techniques were employed. As a result, a complete description of the changes in click-evoked potentials during sleep and waking is obtained. O.H.

A70-40918 The effects of yaw on conical wings at high supersonic speeds. R. Hillier (Cambridge University, Cambridge, England). *Aeronautical Quarterly,* vol. 21, Aug. 1970, p. 199-210. 7 refs. Research supported by the Science Research Council.

In recent papers Squire has presented results for the shock shape and pressure distribution on the lower surface of unyawed, lifing, conical bodies with sharp leading edges. The work, a development of Messiter's first-order correction to Newtonian theory, was successfully applied to wings of diamond and caret section. This paper shows how the method may be used to include the effects of yaw. Results are presented here for the flat wing and some biconvex sections. Comparisons are made with experiment for both the flat and biconvex wings and agreement is shown to be good. (Author)

A70-40988 Advanced Integrated Life-Support Systems and the impact of mission parameters. Gilbert N. Kleiner (United Aircraft Corp., Hamilton Standard Div., Windsor Locks, Conn.). In: Space systems and thermal technology for the 70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. (A70-40976 21-31) New York, American Society of Mechanical Engineers, 1970. 16 p.

A study of the Advanced Integrated Life Support Systems (AILSS) reviewed and analyzed the environmental-control and life-support equipment and techniques available to close the loop, except for food, of man's metabolic process for a 200- to 900-day (1976 to 1980) space flight with a 6- to 18-man crew and no resupply. The extended duration and no-abort mission definition of this study placed prime emphasis on practical considerations in such areas as maintenance, crew stress, and reliability in addition to more classical considerations of weight, power, and volume. This paper

describes the basic life-support subsystems and systems selected to meet requirements for three power and waste heat sources. In the selected systems, carbon dioxide is collected and oxygen and potable water are regenerated with no stored supplies needed for normal crew consumption; trace contaminants and microbiological controls are maintained; food is stored; and waste materials are processed for disposal. Impacts on the systems from varying mission parameters (such as flight date, crew size, power penalty, cabin leakage, and mission length) are described, as are effects of a diluent change, unmanned mode, artificial gravity, and resupply. (Author)

A70-40990 * Carbon dioxide control and oxygen generation. P. D. Quattrone (NASA, Ames Research Center, Moffett Field, Calif.), A. D. Babinsky (TRW Systems Group, Cleveland, Ohio), and R. A. Wynveen (Life Systems, Inc., Cleveland, Ohio). In: Space systems and thermal technology for the 70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. (A70-40976 21-31) New York, American Society of Mechanical Engineers, 1970. 8 p. 11 refs. Contract No. NAS 2-4444.

NASA has developed a carbon dioxide concentrator subsystem and a static-feed water electrolysis subsystem for use in breathing systems for military aircraft and spacecraft life support systems. This paper describes these subsystems, the subsystem test program just completed, test results, spacecraft application, and projected size and weight for a spacecraft prototype system. A systems analysis (including trade-off data) is also included. (Author)

A70-40991 Oxygen generation on a long space mission. Eric E. Auerbach (United Aircraft Corp., Hamilton Standard Div., Windsor Locks, Conn.). In: Space systems and thermal technology for the 70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. (A70-40976 21-31) New York, American Society of Mechanical Engineers, 1970. 20 p.

Selection of a method of oxygen generation on a long space mission is influenced by mission characteristics. The Advanced Integrated Life Support System (AILSS), for example, regenerated metabolic oxygen from waste carbon dioxide and water in a solid electrolyte reactor and supplied leakage makeup from high pressure gas storage. This approach is best for a low leakage, 500-day mission with no resupply. However, differences in mission duration, crew size, power penalty and criticality, resupply, flight date, and vehicle leakage can change the selected approach. In particular, a Sabatier reaction system with methane dump and a Bosch system are attractive for certain mission conditions. (Author)

A70-40992 A spacecraft electrolytic oxygen-nitrogen generation system. B. M. Greenough and T. M. Olcott (Lockheed Missiles and Space Co., Sunnyvale, Calif.). In: Space systems and thermal technology for the 70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. (A70-40976 21-31) New York, American Society of Mechanical Engineers, 1970. 14 p. 8 refs.

For a long-duration, manned-spacecraft mission, nitrogen may be used as an inert diluent of the spacecraft atmosphere to reduce the potential fire hazard of a pure oxygen environment and to increase the physiological acceptability of the habitat. Some form of nitrogen storage must be provided to replenish that lost by cabin leakage. Chemical storage of nitrogen in the form of a stable liquid, which can be added to the electrolysis system as required and which will react to form nitrogen at the oxygen electrode, offers the advantage of weight savings over such alternative approaches as cryogenic or high pressure gaseous storage of nitrogen. The basic electrolysis system utilized for oxygen-nitrogen generation consists of dual-matrix, liquid-center cells with a circulating electrolyte. The authors demonstrated experimentally the use of hydrazine for the nitrogen reaction and established the reaction mechanisms. They also evaluated, for various leak rates and cabin sizes, a computer program model of a 3-man oxygen-nitrogen control system to provide automatic control of cabin total pressure and oxygen partial pressure. Adequate control was demonstrated over an order of magnitude leak range using hydrazine feed and applied electrolysis current as the control parameters. (Author)

A70-40993 Selection of electrolytes for electrolysis cells - Alkaline or acid. F. H. Schubert (Life Systems, Inc., Cleveland, Ohio). In: Space systems and thermal technology for the 70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. (A70-40976 21-31) New York, American Society of Mechanical Engineers, 1970. 12 p. 26 refs.

The paper quantitatively illustrates the effect of the electrolyte nature on a Water Electrolysis System (WES) design. The objective was to select either an acid or a base electrolyte for use in the WES for a space station life-support system. Selection of an alkaline electrolyte was based on a comparison of system equivalent weights. The system, using the alkaline electrolyte at 190 F, presents a 15- to 21-per cent savings in equivalent weight when compared to a 190 F acid system. A 34- to 46-per cent savings results when compared to an 80 F acid system. The major (50 to 85 per cent) contributor to the system equivalent weight results from the power penalty. The added system weight to remove carbon dioxide from the feed water is less than 2 per cent. (Author)

A70-40994 Application of radioisotopes to water recovery system for extended manned aerospace missions. Courtney A. Metzger (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: Space systems and thermal technology for the 70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. (A70-40976 21-31) New York, American Society of Mechanical Engineers, 1970. 10 p. 9 refs.

Research conducted to obtain a process and system design for the recovery of potable drinking water from human waste during extensive space flights revealed that the most promising process required considerable thermal energy for satisfactory operation. To meet the need for thermal energy, radioisotopes were investigated and found to conform with the known requirements. The Air Force laboratory model vacuum distillation-vapor filtered catalytic oxidation water recovery system was redesigned to accept radioisotopes to replace electric energy, and specific isotopes were designed for integration with the Air Force modified system. This paper reviews the design and development of the Air Force modified system and gives detailed data on two (41- and 45-day) tests with the isotopes in place supplying the total thermal energy. The complex system is considered a technological breakthrough and, for the first time, a radioisotope-fueled system is programmed for a 90-day manned chamber test, recovering drinking water from human waste for consumption by four crewmen during the experiment. (Author)

A70-40995 Water recovery by vapor pyrolysis. J. D. Schelkopf, R. W. Murray (General Electric Co., Philadelphia, Pa.), and J. Lindberg (North American Rockwell Corp., Downey, Calif.). In: Space systems and thermal technology for the 70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. (A70-40976 21-31) New York, American Society of Mechanical Engineers, 1970. 9 p. Research sponsored by the North American Rockwell Corp.

A space type unit for potable water recovery from urine, utilizing vacuum distillation at 120 F and vapor pyrolyzation at 1200 F, was developed and tested. A flow control method, using flexible diaphragms to meter in a known amount of urine while displacing an equal amount of potable water, permitted automatic system opera-

tion. Urine solids were effectively separated and conveyed to storage by centrifugal action. Plexiglas covers permitted visual observations of the evaporation and condensation processes. Recovery efficiency on a urine in-water out basis exceeded 94 per cent over a continuous 5-day test, with an average urine flow rate of 17.6 lb per day. Analyses on recovered water samples indicated the water to be potable and sterile. (Author)

A70-40996 An introduction to the waste management problem for large space stations. G. C. Schaedle and G. E. Laubach (North American Rockwell Corp., Space Div., Downey, Calif.). In: Space systems and thermal technology for the 70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. (A70-40976 21-31) New York, American Society of Mechanical Engineers, 1970. 9 p. 10 refs.

Description of a candidate waste model and waste accumulation for crew sizes from 12 to 100 men and the system alternatives that are available to the designer. The program decisions of logistics utilization for removal, the contamination impact of overboard venting, the possibility of waste utilization, and the types of processing that need detailed study are identified. (Author)

A70-40997 * The processing of human wastes by wet oxidation for manned spacecraft. R. B. Jagow, R. J. Jaffe (Lockheed Missiles and Space Co., Sunnyvale, Calif.), and C. G. Saunders (NASA, Langley Research Center, Hampton, Va.). In: Space systems and thermal technology for the 70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. (A70-40976 21-31) New York, American Society of Mechanical Engineers, 1970. 9 p.

The wet oxidation process, which offers great potential for application to spacecraft waste processing, involves the oxidation of a waste slurry at temperature and pressure in the presence of water vapor and oxygen. The reaction conditions are such as to provide relatively clean effluent gas and liquid products. The primary advantages of the process are the recovery of useful water and gases from urine and feces, the reduction of urine and fecal waste to a very small volume of completely sterile nondegradable ash, and the elimination of overboard venting of waste liquids and gases. The paper describes the underlying waste treatment process, gives the commercial application, discusses adaptation to spacecraft use, and identifies the need for a laboratory investigation of process conditions. The laboratory program, which defined requirements for a spacecraft prototype system, included investigation of reaction temperature, time, oxygen partial pressure, per cent excess oxygen, and feed slurry solids concentration. The authors also studied the effects of liquid phase catalysts for the wet oxidation process as well as vapor phase catalysts for gaseous cleanup. (Author)

A70-40998 * Integrated temperature control, humidity control, and water recovery subsystem for a 90-day Space-Station Simulator test. G. E. Allen, M. S. Bonura, E. C. Thomas, and D. F. Putnam (McDonnell Douglas Astronautics Co., Huntington Beach, Calif.). In: Space systems and thermal technology for the 70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. (A70-40976 21-31) New York, American Society of Mechanical Engineers, 1970. 6 p. 8 refs. Research sponsored by the McDonnell Douglas Astronautics Independent Research and Development Program; Contracts No. NASw-1612; No. NAS 1-8997.

This paper describes the integrated temperature control, humidity control, and water recovery subsystem provided for a 90-day manned test in the McDonnell Douglas Space Station Simulator (SSS). The design was evolved over the last six years and incorporates the lessons learned from more than 3600 hours of bench testing, and 143 days of manned chamber testing. The subsystem was designed to perform three major functions: (1) maintain total comfort in terms of temperature and humidity, (2) provide all potable water for the crew, and (3) accommodate tests to provide design criteria for a real space station. The realistic configuration could be used in a space-station application. It is compact, highly reliable, easy to maintain, suitable to many cabin pressures and atmospheric gases, and adaptable to both performance and component modifications. (Author)

A70-41003 * Experimental concepts of life detection for planetary exploration. Vance I. Oyama, Bonnie J. Berdahl, Glenn C. Carle, and Edward L. Merek (NASA, Ames Research Center, Moffett Field, Calif.). In: Space systems and thermal technology for the 70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. (A70-40976 21-31) New York, American Society of Mechanical Engineers, 1970. 11 p. 16 refs.

Proposal of an experiment to detect active biology for unmanned planetary exploration. The concept, involving utilization of a sample from an extraterrestrial source to elicit biological responses, is described, and is justified on the premise that life will require water and organic substances. Terrestrial soil samples and pure strains of microorganisms are shown to display the activities of growth, catabolism, and anabolism. The derived data are interpretable and correlative. F.R.L.

A70-41134 Multifocal atrial tachycardia (chaotic atrial tachycardia) - Clinical associations and significance. Manuel J. Lipson (New England Medical Center Hospitals, Boston, Mass.) and Shapur Naimi (Tufts University, Boston, Mass.). *Circulation,* vol. 42, Sept. 1970, p. 397-407. 8 refs.

Review of results obtained in multifocal atrial tachycardia, also designated chaotic atrial tachycardia, which was identified in the records of 31 patients. It was particularly noted that the arrhythmia progressed to atrial fibrillation or flutter in 17 cases. Unifocal or multifocal premature atrial contractions preceded the arrhythmia in 20 cases. The arrhythmia developed during an acute illness in 18 cases. However, it occasionally occurred in paroxysms without an apparent cause in patients with chronic disease. Significant acute or chronic pulmonary disease was present in 12 cases. The arrhythmia was not associated with digitalis toxicity or with rhythm disturbances known to occur in digitalis intoxication such as paroxysmal atrial tachycardia with block. In general, digitalis therapy seemed to have little effect on the course of the arrhythmia, but in some cases it appeared to be beneficial, especially if atrial fibrillation supervened. In several patients there seemed to be a transition from multifocal premature atrial contractions through chaotic atrial tachycardia to atrial fibrillation. These observations suggested that chaotic atrial tachycardia might be a forewarning of atrial fibrillation and that the two arrhythmias may have a similar mechanism. M.M.

A70-41135 Acute effects of ethanol ingestion on the response to submaximal and maximal exercise in man. Gunnar Blomqvist, Bengt Saltin, and Jere H. Mitchell (Texas, University, Dallas, Tex.). *Circulation,* vol. 42, Sept. 1970, p. 463-470. 21 refs. PHS Grant No. HE-06296.

Study of the acute effects of ingestion of ethanol on the response to submaximal and maximal exercise by noninvasive technics in a group of eight healthy men, ages 21 to 33. Cardiac output and intra-arterial pressures were measured in a separate series of experiments in a subgroup of four subjects. Heart rates at rest and during submaximal exercise were higher after ingestion of ethanol, but there was no effect on stroke volume. After ingestion of ethanol cardiac output at rest and during submaximal exercise increased. The circulatory response to maximal work was not affected by ethanol. Maximal oxygen uptake did not change. Pulmonary ventilation was not altered during submaximal exercise but was reduced during

maximal work. These findings are in agreement with data from animal experiments suggesting that ethanol in blood concentrations below 200 mg/100 ml has no significant depressive effect on performance of the normal heart. M.M.

A70-41140 Study of the transient state of sweating in man (Etude de la phase transitoire de la sudation chez l'homme). J. Timbal, J. Colin, and C. Boutelier (Centre d'Essais en Vol, de Médecine Aérospatiale, Brétigny-sur-Orge, Essonne, France). *Pflügers Archiv,* vol. 318, no. 4, 1970, p. 305-314. 18 refs. In French.

Study of sweating in man according to the method of abrupt rise of ambient temperature. Thirteen male and one female subject were submitted to 138 experiments. The time constant characterizes the transient state, previously described by an exponential equation. This transient state appeared to be a very long phenomena, as the values of the time constant range from 6 to 22 min. The time response is slightly shortened by increasing the external thermal load. Conversely, the time response is longer if the heat storage is less at the onset of sweating. Preheating, established sweating, tend to slightly quicken and, conversely, precooling, and (perhaps) female hormones tend to slow down the phenomena. However, the influence of these factors cannot be considered as significant. Other factors, not controlled in these experiments, can perhaps explain the variability of the time constant within the observed limits. (Author)

A70-41141 Efferent influence on the vestibular organ during active movements of the body. R. Klinke (Berlin, Freie Universität, Berlin, West Germany). *Pflügers Archiv,* vol. 318, no. 4, 1970, p. 325-332. 20 refs. Research supported by the Deutsche Forschungsgemeinschaft.

Investigation of the effect of a stimulus consisting of a pattern of moving stripes on the induction of optokinetic turning movements, which are active movements, in the goldfish. Experiments are described in which recordings were made from the primary afferent fibers of the horizontal semicircular canal of relaxed goldfish. The observed changes in the afferent activity are discussed. O.H.

A70-41142 The role of the cortical parts of the cerebellar hemispheres in discrimination learning of cats. H. N. Davis, G. M. Watkins, W. F. Angermeier, and F. J. Rubia (München, Universität, Munich, West Germany; Florida Presbyterian College, St. Petersburg, Fla.). *Pflügers Archiv,* vol. 318, no. 4, 1970, p. 346-352. 10 refs. Research supported by the Deutsche Forschungsgemeinschaft.

Investigation of the effects of bilateral cortical cerebellar hemispheric ablations upon light-dark discrimination learning in cats. Experiments are described in which the discrimination task consisted of an instrumentally conditioned bar-pressing response. The results showed that almost during the entire 23-day learning period, the experimental cats performed more poorly on the discrimination task than the control cats. The mechanism responsible for this discrepancy is discussed. O.H.

A70-41143 The use of high resistance thermistors in recording thermodilution curves. A. Vliers, N. Knop, K. R. Visser, T. van der Werf, J. P. Zock, and W. G. Zijlstra (Groningen, Rijksuniversiteit, Groningen, Netherlands). *Pflügers Archiv,* vol. 318, no. 4, 1970, p. 366-370. 11 refs. Research supported by the Nederlandse Organisatie voor Zuiver Wetenschappelijk Onderzoek.

By analyzing the measuring system used for recording thermodilution curves, it is shown that a main source of error is the effect of blood flow variations on thermistor temperature. This effect can be kept small by minimizing the temperature difference between thermistor and blood. Therefore power dissipation in the thermistor should not exceed a certain, calculable value, if a predetermined accuracy is to be obtained. It is demonstrated that for a given power dissipation the sensitivity of the system can be increased by using a high resistance thermistor. (Author)

A70-41199 * A stochastic model of skeletal muscle based on motor unit properties. John C. Coggshall (California, University, La Jolla, Calif.) and G. A. Bekey (Southern California, University, Los Angeles, Calif.). *Mathematical Biosciences,* vol. 7, 1970, p. 405-419. 23 refs. Grants No. NGR-05-018-022; No. AF AFOSR 1018-67B.

Formulation of a mathematical model of force generation by the skeletal muscle taking into consideration the properties of the so-called 'motor unit.' Using known data from cat motor units and with the assumptions of linearity and that twitch initiations obey a Poisson distribution, the dynamic force response of a whole muscle is calculated and compared with published experimental data. Z.W.

A70-41223 * Transient acceleration of transmural water flow by inhibition of sodium transport in turtle bladders. Theodore P. Schilb and William A. Brodsky (New York, City University, New York, N.Y.). *American Journal of Physiology,* vol. 219, Sept. 1970, p. 590-596. 12 refs. NIH Grants No. AM-13037; No. AM-13138; No. AM-13674; NSF Grant No. GB-7764; Grant No. NGR-33-171-001.

Investigation of the osmotic properties of turtle bladder walls. Sacs from urinary bladders of fresh water turtles were filled with and immersed in Ringer solution. After either of two inhibitors of sodium transport, acetyl-beta-methylcholine (Mecholyl) or ouabain, was added to the serosal fluid, the rate of water transfer from the mucosa to the serosa increased by three- to fourfold for 30-60 min while the rate of salt transfer in the same direction decreased. The Mecholyl-induced acceleration in the rate of water transfer occurred even in the presence of an opposing transmural osmotic gradient. M.V.E.

A70-41224 * Properties of isolated mucosal and serosal fractions of turtle bladder. M. E. LeFevre, J. F. Gennaro, and W. A. Brodsky (Institute for Medical Research and Studies; New York, City University; New York University, New York; Brookhaven National Laboratory, Upton, N.Y.). *American Journal of Physiology,* vol. 219, Sept. 1970, p. 716-723. 37 refs. AEC-NASA-supported research; NIH Grant No. AM-13037; NSF Grant No. GB-7764.

Investigation of the histological and physiological properties of both the isolated mucosal layer and the supporting tissue layer of turtle bladders. Urinary bladders of turtles were dissected into two fractions, and properties of the isolated fractions relevant to the ion transport function of the bladder were investigated. The mucosal fraction, 30% of the dry weight, accounted for 78% of the oxygen uptake of whole-bladder tissue. Histological studies showed that the isolated mucosal fraction is composed of approximately one-half epithelial cells and one-half connective tissue, while the whole bladder wall is composed of approximately 18% epithelial cells, 40% smooth muscle, and 42% connective tissue. The sodium-dependent fraction of oxygen consumption of the isolated mucosal and serosal fractions was determined. M.V.E.

A70-41225 Brain oxygenation in the rat during hyperventilation with air and with low O2 mixtures. A. T. Miller, Jr., K. E. Curtin, A. L. Shen, and C. K. Suiter (North Carolina, University, Chapel Hill, N.C.). *American Journal of Physiology,* vol. 219, Sept. 1970, p. 798-801. 19 refs. Contracts No. DA-49-193-MD-2371; No. AF 41(609)-3125.

Rats anesthetized with sodium pentobarbital were pump-ventilated with air, or with 10 or 7% oxygen in nitrogen, to PaCO2 levels ranging from normal (35-37 mm Hg) down to 10 mm Hg or lower, for periods of 15 or 45 min. The resulting state of oxygenation of the brain was judged from measured values of brain creatine phosphate concentration and lactate:pyruvate ratio. Graded hyperventilation with air resulted in progressive increases in brain lactate and pyruvate concentrations but no changes in lactate: pyruvate ratio or in creatine phosphate concentration. Normal ventilation with 10 or 7% oxygen resulted in cerebral hypoxia and arterial hypotension, both of which were partially corrected by

hyperventilation. It is concluded that even extreme hyperventilation with air produces little or no cerebral hypoxia in the rat, and that hyperventilation in response to hypoxia improves brain oxygenation, the degree of improvement increasing with both the severity of the hypoxia and the intensity of the hyperventilation. (Author)

A70-41226 Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. Edited by A. Falcão de Freitas (Serviço de Terapeutica Médica, Oporto, Portugal). Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970. 368 p. $18.95.

Contents:

A70-41227 The effects of cardiac glycosides and of a beta-receptor blocking agent on the ULF displacement ballistocardiogram in healthy young men. N. Zöllner, G. Lohmöller, K. Schnelle, and H. Lydtin (München, Universität, Munich, West Germany). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 42-48. 6 refs.

Description of a method for measuring heart rate, systolic and diastolic blood pressure, and other parameters by injecting cardiac glycosides and a blocking agent in healthy young men. The method gives reproducible measurements of parameters closely correlated with contraction velocity in one individual with minimal discomfort under true resting conditions. The results obtained are generally in agreement with present pharmacologic concepts of the action of the drugs tested. M.M.

A70-41228 Modifications of the ballistocardiogram in altitude. J. C. Chignon (Institut National des Sports, Paris, France) and R. Distel (Paris, Université, Laboratoire de Physiologie Générale, Paris, France). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 74-77. 6 refs.

Investigation of the possible existence of modifications of the velocity ballistocardiogram during a stay at the altitude of 2000 m. The results obtained have shown that: (1) a significant increase of the amplitudes of the main waves which diminishes gradually during the stay; and (2) a parallel decrease of the RJ and RI durations. These modifications are not explained by the variations of the cardiac period. M.M.

A70-41229 The differential sphygmogram and lean body mass in a group of 18 young men. G. Južnič, J. Sketelj, Živa Novak, and D. Keber (Ljubljana, Univerza, Ljubljana, Yugoslavia). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 94-107. 16 refs. Research supported by the University of Ljubljana.

Differential sphygmographic study (DS) of 18 young men, ages 18 to 22. Lean body mass (LBM) was determined on the basis of anthropometrical data. The sphygmogram and differential sphygmogram with first and second derivative were recorded. Correlations between the amplitudes of carotid pulse and LBM were calculated and are positive. The genesis and advantages of the DS curve, compared with ULF-Bcg (ballistocardiogram) curve are discussed. M.M.

A70-41230 Factor analysis as to influences of systemic hypertension on Bcg. K. Onodera, K. Sasaki, M. Saito, A. Kato, M. Oikawa, and Y. Oike (Hirosaki University, Hirosaki, Japan). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 108-115.

Multivariate analysis of hypertensive findings in ballistocardiograms (Bcg) to facilitate their interpretation. It is pointed out that many obscure questions in hypertensive Bcg can be solved by a modified multivariate analysis. Many Bcg findings as to hypertension can be summarized into 5 factors. The 5 factors can be used for discriminating the following 4 groups from each other: the young normotensive, the young hypertensive, the older normotensive, and the older hypertensive. M.M.

A70-41231 Effect of hypoxia and hyperoxia on the quantitative ballistocardiogram. Z. Trefný (District Health Centre,

Prague, Czechoslovakia) and J. Svačinka (Institute of Aviation Medicine, Prague, Czechoslovakia). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 119-124.

Ballistocardiographic study of the effect of hypoxia and hyperoxia in ten healthy male subjects. The systolic force (F) and the minute cardiac force (MF) were determined by the quantitative ballistocardiographic method, while, at the same time, the heart rate (HR) and blood pressure were registered. In hypoxia an increase in MF was noticed, mostly due to an increase in HR, whereas the increase in F was less significant. In hyperbaroxia a statistically significant decrease in MF was observed, caused both by the decrease of HR as well as of F, the latter being statistically more significant. M.M.

A70-41232 Relation between the quantitative ballistocardiogram and the index of the cardiac performance in conditions of different pO2. Z. Trefný (District Health Centre, Prague, Czechoslovakia) and J. Svačinka (Institute of Aviation Medicine, Prague, Czechoslovakia). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 125-129. 8 refs.

Investigation of the relation between the systolic force (F) and the minute cardiac force (MF) determined by the quantitative ballistocardiographic method, and cardiac performance in conditions of hypoxia and hyperoxia. The ballistocardiographic results were compared with the systolic pressure multiplied by heart rate multiplied by 10 to the minus second power, this index being, according to the literature, a good parameter of cardiac performance. A linear correlation of high statistical significance between this index and the systolic force (F) and especially the minute cardiac force (MF) was found. It follows that these ballistocardiographic characteristic quantities are suitable for use as parameters of cardiac performance. M.M.

A70-41233 Effect of graduated work load on the quantitative ballistocardiogram. Z. Trefný (District Health Centre, Prague, Czechoslovakia), V. Seliger, and J. Pachlopnik (Karlova Universita, Prague, Czechoslovakia). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 130-134.

Examination of the values of the minute cardiac force (MF) in two groups of 14-yr-old boys and two groups of adults, using a bicycle ergometer for submaximal and maximal work load. Simultaneously, the cardiac output was measured by the CO2-rebreathing method. From the values of the minute cardiac force it was possible to distinguish persons with different working capacity of the circulatory system which is in close connection with physical fitness. M.M.

A70-41234 The use of ultra-low frequency ballistocardiograms in clinical practice with special reference to the causes of amplitude variations. J. Eldrid Smith (United Air Lines, Inc., Washington, D.C.). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 152-155.

Investigation of the relationship between the velocity of blood flow in the major blood vessels and the amplitudes of the ULF ballistocardiogram. The results obtained warrant the conclusion that certain types of ballistocardiograms with low amplitude and abnormalities of waveform carry a markedly increased risk of cardiovascular disease, and that the amplitude variations, especially in those people with high amplitudes, are reactive to the environment, the doctor, and the examination. M.M.

A70-41235 Transcutaneous observation of blood velocity in the ascending aorta in man. L. H. Light (Medical Research Council, National Institute for Medical Research, London, England). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 214-221.

Description of a technique for obtaining information on the hemodynamic performance of the heart and on systemic perfusion. Using a transcutaneous ultrasonic Doppler technique it was found possible to obtain reflections in most human subjects from the blood flow in the ascending aorta which are sufficiently strong to allow the flow velocity vs time waveform to be obtained by electronic processing. It should be possible to extract quantitative information on acceleration, peak flow velocity and relative stroke volume, if the beam is aimed to intersect the aortal arch approximately tangentially. It is pointed out that, if preliminary expectations are confirmed, the technique should have a wide application potential in research and clinical medicine because of its relative convenience and safety. M.M.

A70-41236 Unicity of information from chest wall vibrations measured by different transducers. J. Cosyns, A. A. Charlier, and F. Lavenne (St. Pierre University Clinics, Louvain, Belgium). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 222-229.

Investigation of the possible convertibility between primary signals from chest wall vibrations measured by different transducers. The conversion was made either by a differentiator, an integrator, or a high-pass filter. It was found that it is possible to obtain a full picture of chest wall vibrations including displacement, velocity, acceleration, and phonocardiogram by means of the same captor. The procedure used presents the following advantages: (1) the acquisition of complete information from thoracic vibrations sampled at the same place for the same heart beat; (2) the possibility of unifying the methods of investigation and of permitting direct comparisons between studies made by different groups; and (3) the basis for standardizing phonocardiography by relating its signals to the third, fourth, or fifth derivative of the chest wall displacement. M.M.

A70-41237 Left ventricular ejection as reflected in the Bcg. P. D. Verdouw and A. Noordergraaf (Pennsylvania, University, Philadelphia, Pa.). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 243-261. 16 refs. PHS Grant No. HE-10, 330-04.

Description of the ballistocardiogram in terms of left ventricular ejection flow and the properties of the vascular system. Computer studies are described to show that the acceleration Bcg is extremely sensitive to changes in the left ventricular ejection pattern. It is demonstrated that the early part of the acceleration Bcg reflects the ejection pattern more clearly and more purely than the later and commonly smaller LMN complex. The velocity Bcg proves to be less suitable for the retrieval of information concerning the left ventricular ejection pattern. M.M.

A70-41238 Calculation of cardiovascular force from phasic regional blood flow. W. K. Harrison (Johns Hopkins University, Baltimore, Md.). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 262-268. 6 refs. PHS Grant No. GM-10895.

Description of an algorithm for the calculation of cardiovascular force from phasic regional blood flow and cardiovascular mass motion. The theory allows predictions to be made of the effects on cardiovascular force of alterations in peak flows, accelerations, blood viscosity, velocity profiles, pulse wave velocity, and the like. Data assumed or taken from the literature yield calculated forces quite similar to those measured by the ultralow frequency ballistocardiogram. Use of the theory in the interpretation of ballistocardiograms is discussed briefly. M.M.

A70-41239 Critical notes on ballistocardiography. G. Elzinga, G. C. van den Bos, and A. A. Knoop (Vrije Universiteit, Amsterdam, Netherlands). In: Ballistocardiography and cardiovascular therapy; Proceedings of the Second World Congress on Ballistocardiography and Cardiovascular Dynamics, Oporto, Portugal, March 31-April 2, 1969. (A70-41226 21-04) Edited by A. Falcão de Freitas. Basel, S. Karger AG (Bibliotheca Cardiologica, No. 26), 1970, p. 269-279. 7 refs.

Discussion of qualitative and quantitative problems that arise in the interpretation of the ballistocardiogram. The most important causes of the difficulties encountered in the interpretation of ballistocardiographic curves are summarized as follows: (1) the Bcg is not recorded in all degrees of freedom; (2) the Bcg is not caused solely by the blood-mass-displacement or the various aspects thereof - from one cardiovascular compartment to another; (3) the Bcg is a summated pattern of all mass-displacements in the body; and (4) the recorded Bcg is not a precise reflection of the various aspects of the summated mass-displacements in the cardiovascular system. M.M.

A70-41269 * L-dihydroxyphenylalanine - Effect on S-adenosylmethionine in brain. R. J. Wurtman, C. M. Rose (MIT, Cambridge, Mass.), S. Matthysse, J. Stephenson, and R. Baldessarini (Massachusetts General Hospital, Boston, Mass.). *Science,* vol. 169, July 24, 1970, p. 395-397. 18 refs. Research supported by the Scottish Rite Program of Research in Schizophrenia; NIH Grant No. MH-16674-02; Grant No. NGR-22-009-272.

Forty-five minutes after intraperitoneal injection of a single dose (100 milligrams per kilogram) of L-dihydroxyphenylalanine, the concentration of S-adenosylmethionine in rat brain was lowered by 76 per cent. As little as 10 milligrams of L-dihydroxyphenylalanine per kilogram decreased content of S-adenosylmethionine in the adrenal medulla by 51 per cent, whereas 100 milligrams per kilogram did not significantly depress concentration of S-adenosylmethionine in the liver in this time interval. Concentration of S-adenosylmethionine in the brain varied diurnally; L-dihydroxyphenylalanine lowered this concentration whether administered at the daily peak or at the nadir. (Author)

A70-41447 Biochemistry of blood group substances - Topochemical aspects (Biochemie der Blutgruppensubstanzen - Topochemische Aspekte). Gerhard Uhlenbruck (Köln, Universität, Cologne, West Germany). *Naturwissenschaftliche Rundschau,* vol. 23, Sept. 1970, p. 361-365. 23 refs. In German. Research supported by the Deutsche Forschungsgemeinschaft.

Discussion of the effects of cell membrane structure on agglutination reactions involving blood group antigens. The 'topochemistry' of antigens is examined and the effect of proteolytic enzymes on antigens which normally are not susceptible to agglutination caused by antibodies is discussed. The proteases destroy a part of the cell membrane of the antigen and, thus, make it susceptible to agglutination. Evidence for the role of the membrane structure in providing protection against agglutination is examined. The importance of neuraminic acid and the effects of neuraminidase regarding the processes considered is discussed. Differences in cell surface structures between normal and tumor cells are investigated and the application of a topochemical approach to some unsolved problems is considered. G.R.

A70-41476 * Brain study in balloon-borne monkeys exposed to cosmic rays. W. Haymaker (NASA, Ames Research Center, Moffett Field, Calif.), O. T. Bailey (NASA, Ames Research Center, Moffett Field, Calif.; Illinois, University, Chicago, Ill.), E. V. Benton (NASA, Ames Research Center, Moffett Field; San Francisco, University, San Francisco, Calif.), F. S. Vogel (NASA, Ames Research Center, Moffett Field, Calif.; Duke University, Durham, N.C.), and W. Zeman (NASA, Ames Research Center, Moffett Field, Calif.; Indiana University, Indianapolis, Ind.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 989-1002. 19 refs.

Attempt to ascertain whether cosmic ray particles coming into the upper limits of the earth's atmosphere have the capacity to injure the brain. The brains of six monkeys exposed to cosmic radiation during high altitude balloon flights lasting 9.5 to 48 hrs were examined. Cosmic ray thindown tracks in the brains of the monkeys on the 48-hour flight were estimated to total approximately 10 tracks per cu cm of brain tissue for cosmic ray particles with Z greater than 6, and approximately 1 track per cu cm of brain tissue for particles with Z greater than 20. Acute vasculitis involving mainly cerebral meningeal vessels was noted in two of the monkeys autopsied relatively soon after one of the flights. The inflammatory cells were found in only short segments of the affected vessels. A consensus as to the cause of the vasculitis could not be reached. In another monkey two wide track lesions devoid of nerve cells were present in the cerebellar cortex. Presumably they antedated the flight, but in actuality the time of their occurrence and their causation could not be established. Narrow tracks were observed in the cerebellar cortex in all six balloon-borne monkeys and also in the control monkeys in about the same incidence. Narrow tracks produced by deuteron microbeams were taken into consideration in evaluation. For certain narrow tracks found in balloon-borne animals, there was the question whether cosmic ray thindowns could have been responsible. No consensus was reached on this point. M.V.E.

A70-41477 Effects of transmeridian flights on the diurnal excretion pattern of 17-hydroxycorticosteroids. H. M. Wegmann, H. Brüner, D. Jovy, K. E. Klein, J. P. Marbarger, and A. Rimpler (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Bad Godesberg, West Germany; Illinois, University, Chicago, Ill.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1003-1005. 12 refs.

The urinary excretion of unconjugated 17-hydroxycorticosteroids (17-OHCS) was studied in 8 male students in 3-hour intervals during periods of 24 hours. Two 24-hour preflight periods revealed the basic normal daily periodicity of 17-OHCS excretion. Effects of a 6-hour time shift were evaluated by determining the excretion rates after flights from Cologne/Germany to Chicago/USA and vice versa on day 1, 3, 5, and 8 after arrival. A desynchronization with the new local time was observed after flights in both directions, the diurnal 17-OHCS excretion patterns being more disturbed, however, after the West-East flight. The resynchronization time of maximum and minimum excretion was about 5-8 days after the westward travel and more that 8 days after traveling in the opposite direction. It is suggested that an unfavorable flight schedule, which at present is practiced by most airlines for flights going from the USA to Europe, mainly accounts for the more marked time shift effects observed after the eastward flight. (Author)

A70-41478 Histochemistry of oxidative enzymes in the nervous system, liver and kidney of rats in immediate and remote periods after 24-hour artificial hypobiosis. V. V. Portugalov, I. B.

Krasnov, E. I. Il'ina-Kakueva, and N. N. Timofeev (Institute of Biomedical Problems, Moscow, USSR). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1008-1012. 25 refs.

With the purpose of appraising histochemically the physiological suitability of the method applied to minimize body functions, the activity of oxidative enzymes of carbohydrate, lipid, amino acid and nucleotide metabolism in the liver, kidney and nervous system of rats was studied in different periods of time after a 24-hour hypobiotic condition achieved with the aid of a neuroplegic mixture and external cooling. The results of the experiments have indicated that a 24-hour artificial hypobiosis gives rise to changes in the activity of the tested enzymes in the liver, kidney and nervous system. The tendency and level of these changes are different, depending on the properties of the enzyme and the role it plays in metabolism. The activity of most enzymes returns to normal by the 3rd to 14th day after the hypobiotic test, remaining unaltered till the 60th day. This gives evidence that metabolism may readily recover after hypobiosis and that the method of artificial hypobiosis is applicable from the physiological point of view. (Author)

A70-41479 Psychophysiological aspects of extended exposure of man to an environment with sensory deprivation. E. A. Il'in and B. B. Egorov (Institute of Biomedical Problems, Moscow, USSR). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1022-1024. 11 refs.

An analysis of the literature and our findings suggests that changes observed on the mental activity of men long exposed to an environment with sensory deprivation are primarily nonspecific, giving evidence for asthenic developments which involve deterioration of the adaptive capabilities of the human being. The fact that humans subjected to sensory deprivation for extended periods of time may easily develop asthenia makes it necessary to elaborate methods for its prevention and treatment. It has generally been accepted that the required level of physiological functions, physical and mental performance and stability of psychic responses may be maintained with the aid of optimal work-rest cycles and physical exercises. We used and tested another method to prevent and treat asthenia developing in response to prolonged sensory impoverishment, i.e., application of drugs. This paper presents our observations. (Author)

A70-41480 * Influence of sodium pentobarbital on mice poisoned by oxygen. Robert E. Thompson and Thomas K. Akers (North Dakota, University, Grand Forks, N. Dak.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1025-1027. 26 refs. NASA-supported research; Contract No. N 00014-68-A-0499.

Male Swiss Webster mice, weighing 25 g, were exposed to oxygen from 11 to 2 ATA. At least two groups of ten mice were poisoned by oxygen at each pressure to establish an LD(100). Decompression, followed by lung water measurement, was accomplished immediately after obtaining each LD(100). A second series of oxygen exposures was performed on an equal number of mice pretreated with 30 mgm/kg sodium pentobarbital. The two functions of mean survival times vs oxygen (11 to 2 ATA) were exponential and not significantly separated. The death times for mice given sodium pentobarbital were shorter that nontreated animals at oxygen pressures below 5 ATA. Respiratory depression coupled with lung failure is an explanation for this finding. Lung water in nontreated and sodium pentobarbital-treated animals was significantly elevated (P less than .001) in all oxygen exposures above control values. At 6 and 7 ATA, there was a significant difference in lung water content between normal and sodium pentobarbital pretreated mice exposed to oxygen. (Author)

A70-41481 Coronary blood flow and electrocardiogram during headward acceleration in unanesthetized dogs. J. E. Chimoskey (U.S. Naval Material Command, Naval Air Development Center, Johnsville, Pa.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1028-1030. 11 refs.

Trained unanesthetized dogs were exposed to brief, 10-second, positive acceleration on the 8-foot animal centrifuge at the Naval Air Development Center, Johnsville. Both the amplitude of the T-wave of the left ventricular surface electrocardiogram and left circumflex coronary artery blood flow velocity decreased during headward acceleration. Post acceleration hyperemia occurred as T-wave amplitude returned to normal. (Author)

A70-41482 * # Detailed study of contaminant production in a space cabin simulator at 258 mm. mercury. J. P. Conkle, J. D. Adams, P. Wolf, B. E. Welch (USAF, School of Aerospace Medicine, Brooks AFB, Tex.), W. E. Mabson (USAF, School of Aerospace Medicine, Brooks AFB, Tex.; USAF, Washington, D.C.), and H. J. Zeft (USAF, School of Aerospace Medicine, Brooks AFB, Tex.; Duke University, Durham, N.C.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1031-1038. 14 refs. NASA-supported research.

Additional information has been accumulated concerning the contaminants associated with habitation by man of a closed confined space. An experiment designed to determine man's contribution to trace contaminants was conducted jointly by the United States Air Force and the National Aeronautics and Space Administration. The experiment was divided into three phases; an unmanned period, a manned period, and a manned period coupled with an activated carbon scrubber. Direct analyses of the sealed environment were not adequate for this comprehensive survey; however, cryogenic fractionation and concentration provided samples with sufficient concentration of contaminants for analysis by means of gas chromatography, infrared spectroscopy, and mass spectroscopy. Of the 142 compounds identified and quantified during the experiment, only 45 were found during the manned phases. (Author)

A70-41483 # Work credit for the aircrewman. Bryce O. Hartman, Dickie A. Harris, and Ralph W. Trimble (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1042-1045. USAF-sponsored research.

The amount of work credited aircrewmen under the Flying Time (FT) system determines rank order for such things as mission scheduling. The FT system gives one unit of work credit per unit of time spent airborne, but it fails to credit all legitimate functions performed by the aircrewman, and it gives no extra credit for work under extreme conditions. Critics imply that ranking order would differ under systems taking these additional factors into account. Using computer-simulated operational data for C-5 aircraft commanders, this implication was explored by correlating a ranking order by the FT system with ranking orders by five 'experimental' systems. Despite wide differences among systems - in terms of credit given for various requirements and difficulties - the correlations were consistently high (ranging from .83 to .95). Thus, at least with airlift-type flight operations, departures from the FT system would not seem beneficial. (Author)

A70-41484 Activation energies of acceleration and hypoxia stress. Freeman W. Cope (U.S. Naval Material Command, Aerospace Medical Research Laboratory, Warminster, Pa.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1045-1047. 10 refs.

The activation energy of 13 kcal/M for loss of peripheral vision in man subjected to acceleration stress of +4 to +5 Gz resembles that of 12 kcal/M for survival of rats at +40 Gz, which suggests that the physiological mechanisms of acceleration protection are similar in the two species. The activation energy of survival to hypoxia stress (mouse) is 8.4 kcal/M which resembles the value of 8 kcal/M obtained for function of the normal human brain (alpha frequency of the EEG), which supports the concept that survival of the organism to hypoxia stress is indeed limited by survival of brain function. The large difference in activation energy of acceleration stress from that of hypoxia or of normal brain function suggests that tolerance to acceleration stress is not limited simply by the ability of nervous tissue to endure hypoxia, but must be dependent upon additional mechanisms. (Author)

A70-41485 **Behavioral changes following repeated low doses of monomethylhydrazine.** Glayde Whitney and Henry L. Taylor (Colorado, University, Boulder, Colo.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1048-1051. 10 refs.

Previous studies have demonstrated the severe disruptive effects on behavior of the rocket fuel monomethylhydrazine (MMH). Toxicity, measured as a decrement in behavior, has been found following dosages of 2.5 mg/Kg or more. The present experiment was designed to determine the effects on behavior of doses lower than those previously studied, and to investigate possible cumulative behavioral effects of repeated exposure to low concentrations of MMH. Two monkeys, whose behavior was maintained on an avoidance schedule which required continual discrimination of cues, were given repeated injections of MMH at 4 dose levels ranging from 0.5 mg/Kg to 4.0 mg/Kg. The findings indicate that exposure to low doses results in significant behavioral stimulation. Indications of a cumulative effect on behavior of repeated exposure were found. (Author)

A70-41486 **Tolerance of rhesus monkeys to PCO2 of 195 mm. Hg at 0.5 atmosphere total pressure.** J. L. Mattsson and J. M. Stinson (USAF, Aeromedical Research Laboratory, Holloman AFB, N. Mex.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1051-1054. 9 refs.

Five undrugged rhesus monkeys were exposed to 0.5 atmosphere total pressure with chamber CO2 increasing at 56 mm Hg/hr until PCO2 of 195 mm Hg, a plateau concentration that was maintained for 17-19.5 hours. Chamber PO2 was 60 mm Hg. As CO2 was increasing, narcosis occurred at mean tracheal PCO2 of 122 mm Hg. One monkey died after a total CO2 exposure of 18 hours, and one monkey was killed by increasing CO2 to 360 mm Hg after a total CO2 exposure of 22.5 hours. In spite of profound hypothermia and extreme depression of heart and respiratory rates, the other three monkeys were successfully removed from the chamber by decreasing the PCO2 slowly. Although serious physiologic alterations occurred, they were reversible. It thus became apparent that acutely lethal CO2 concentrations are not likely to occur in low pressure environments. (Author)

A70-41487 * **Retinal dehydrogenases in rabbits exposed to 100 percent oxygen.** Anne M. Shaw and Henry A. Leon (NASA, Ames Research Center, Moffett Field, Calif.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1055-1060. 22 refs.

Discussion of the activities of several dehydrogenases in retina homogenates from rabbits exposed to oxygen at 600 or 760 torr for various periods of time. Electroretinograms were taken once or twice daily during exposure as an indicator of visual cell function. The b wave of the electroretinogram was depressed after 30 hr exposure to 760 torr or 3 days exposure to 600 torr, and histologically evident visual cell death had occurred by 48 hr at 760 torr or 4 days at 600 torr. There was no significant change in lactic dehydrogenase activity or in triose phosphate dehydrogenase activity in the retina during oxygen exposure. Glucose-6-phosphate dehydrogenase activity remained normal for the first 36 hr exposure to 760 or 3 days exposure to 600 torr, but was significantly depressed after 48 hr at 760 or 4 days at 600 torr. The activity of its companion pentose shunt enzyme, 6-phosphogluconate dehydrogenase, did not change significantly. Succinic dehydrogenase activity was slightly depressed after as little as 24 hr exposure to 760 torr, and was significantly depressed after 48 hr. Supplementary determinations on the oxygen-exposed rabbits revealed no change in retinal nonprotein sulfhydryl concentration, retinal lipid antioxidant activity, hematocrit, blood glutathione, or plasma glucose. Retinal detachments were not observed in pigmented rabbits exposed to oxygen at 600 torr or 760 torr although visual cell death occurred in these animals. M.V.E.

A70-41488 * **Animal restraint - Application in space (weightless) environment.** R. R. Burton and John R. Beljan (California, University, Davis, Calif.). *(Aerospace Medical Association, Annual Scientific Meeting, 41st, St. Louis, Mo., Apr. 27-30, 1970.) Aerospace Medicine,* vol. 41, Sept. 1970, p. 1060-1065. 16 refs. Contract No. NAS 2-5245.

Chronic restraint was found to produce a typical environmental type stress response in the adult male domestic fowl. This included a relative lymphopenia and loss of body mass resulting in death if continued for several days. Approximately 50% of the restrained animals were thus affected. Repeated restraint trials on the same birds indicated statistically (analysis of variance) that this stress response was an individual animal characteristic. A restraint method was developed and described for the domestic fowl which was apparently not physiologically stressful nor did it produce immobilization. The degree of restraint however, was considered sufficient as an animal orientation aid for space (weightless) experimentation. These birds appeared to tolerate this form of chronic restraint for several months without significant changes in their hematology or several other determined physiological parameters. (Author)

A70-41490 **Neurotic syndromes in aviation medicine.** C. J. Blanc and E. Lafontaine (Compagnie Nationale Air France, Paris, France). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1070-1073. 13 refs.

This survey is based on the analysis of 2500 psychiatry consultations carried out in the aviation field over the last seven years. The most widely represented psychiatric manifestions are relatively stabilized neurotic syndromes or those in the decompensation phase. Out of the total percentage of examined patients we found 80% of the cases among stewardesses, 50% among stewards, 35% among flight deck crew members, and 60% among ground staff. We used a classification system so as to make a distinction between five neurotic conditions: acute neurotic reactions; anxiety neuroses; neurotic depressions; structured neurotic syndromes; psychosomatic disorders. Our observations lead to several conclusions: (1) frequency of 'patchwork structures' with the interference of various neurotic traits in opposition to the relatively rare occurrence of the conventional neuroses in classical psychiatry, (2) frequency of complex etiological interference. Growing importance of the social, cultural and technological contexts of the modern world, with civilization itself becoming a pathogenic factor, and (3) difficulty of establishing a definite boundary between neurotic conditions and the area of normalcy, which raises complex problems when a selection is to be made. With the forthcoming onset of high-capacity and supersonic aircraft, the problems of detecting and treating neurotic syndromes in the aviation field are becoming of primary importance. (Author)

A70-41491 **Statistical data on waivers granted to airline flight crew members.** J. Laverne and E. Lafontaine (Compagnie Nationale Air France, Paris, France). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1073-1075.

One hundred and forty-one (9%) Air France flight crew members do not fully comply with French medical requirements, based on ICAO standards and recommended practices, and have been granted waivers by the French Civil Aviation Medical Board. Eighty-four of these are pilots and the other fifty-seven are flight crew members such as flight engineers and navigators. The most frequent grounds for waivers are a drop in auditory acuteness (91 cases), ocular disorders coming second (39 cases) and, lastly, miscellaneous causes (25 cases). Fourteen flight crew members have individually obtained two waivers. These waivers are only granted after each particular case has been thoroughly examined by a medical specialist and a group of aviation medicine experts, if need be after an inflight check. Beneficiaries must attain standards that are not too far from those usually required as this would otherwise impair the effectiveness of such standards. The granting of waivers should remain an exceptional practice. The relatively high percentage of waivers granted in France is due to the fact that, in regard to ophthalmology and audiology, the national medical requirements are

appreciably stricter than ICAO standards. In cases where ICAO standards are not complied with, waivers are, in principle, rejected by the French government authorities. (Author)

A70-41492 Aeromedical consultation service case report - Aortic insufficiency. Lawrence J. Enders and Timothy N. Caris (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1076, 1077.

In the last ten years, 27 flyers with aortic insufficiency have been returned to flying duties after complete evaluation determined that the valvular defect was hemodynamically insignificant. Follow-up has ranged from two to ten years. During this period only three of these flyers have gone on to develop a cardiovascular dysfunction, prompting us to recommend removal from flying status. Moreover, only one of the three showed the slightest degradation in +Gz tolerance. This paper discusses these three cases and their significance. (Author)

A70-41493 # Aeromedical consultation service case report - Hysterical neuroses with syncopal or epileptiform symptoms (American Psychiatric classification 300.1). Paul L. Richter, C. Fletcher Watson, and Timothy N. Caris (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1078-1080. 9 refs. USAF-sponsored research.

Neurotic reactions of the syncopal or epileptiform type (hysterical seizures) may be confused respectively with syncope or epilepsy. The unique occurrence of grande hysterie in a student pilot is described and clinical and aerospace aspects of hysterical and dissociative reactions of this type are discussed. (Author)

A70-41494 An approach for detection of latent coronary heart disease in flyers. Timothy N. Caris (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). *Aerospace Medicine,* vol. 41, Sept. 1970, p. 1081-1085. 50 refs.

The usual basis of medical evaluation, the history and physical examination, may fail completely in uncovering a significant number of flyers with coronary heart disease. The periodic electrocardiogram has been a valuable adjunct, but it too may fail to detect advanced disease prior to actual myocardial infarction. The postexercise electrocardiogram has proved to be a successful detector of those in the high risk group prior to overt manifestations of the disease, but this procedure in itself cannot be the only criterion for making a final medical decision. (Author)

A70-41696 An electrokinetic model of transduction in the semicircular canal. Dennis P. O'Leary (Iowa, University, Iowa City, Iowa). *Biophysical Journal,* vol. 10, Sept. 1970, p. 859-875. 36 refs. PHS Grant No. NB-05188.

Study of transduction in the semicircular canal by focusing an IR beam on either side of exposed ampullae from the posterior canals of Rana pipiens. The direction of fluid movement resulting from a stimulus was inferred by observing the polarity of the change in afferent impulse mean rate relative to the spontaneous value. On the basis of the accepted functional polarization of this receptor, the results indicate that fluid moved toward the warmer side of the ampulla. Convection and thermal reception were shown to be unlikely explanations for these results. Moreover, cupular displacements toward the warmer side would not be expected. Because thermoosmosis can cause fluid to move toward the warmer side in a gelatin membrane, the results can be interpreted as evidence that thermoosmosis occurred in the gelatinous cupula and influenced the transduction mechanism. Thermoosmosis of liquids appears to be due to an electric field that is set up in a charged membrane; hence, the hair cells might have detected an electric field that occurred in the cupula during thermoosmosis. It is suggested that electroreception by the hair cells could be an explanation of the great sensitivity that has been observed in the semicircular canal and other labyrinthine receptors. Z.W.

A70-41723 Human error - The cause behind the cause. J. M. Rolfe (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). *Flight International,* vol. 98, Aug. 27, 1970, p. 307-310.

Discussion of the causes behind human error as a factor in aircraft accidents. The makeup of the human operator is examined in order to determine the ways by which he can be forced into incorrect action. It is shown that accidents can also occur because of an error on the part of the designer, operations executive, maintenance engineer, and air traffic controller. Many accidents are the results of the cumulative effects of a number of errors rather than one sole error. Human error may be considered as being the outcome of the incompatibility of man and machine. Effort must be made to ensure that the demands of the flight environment do not exceed the physiological and psychological capabilities of the personnel expected to work in that environment. F.R.L.

A70-41991 # Inner ear of the bullfrog (Sull'orecchio interno della Rana catesbyana). L. De Luca. *Alta Frequenza,* vol. 39, July 1970, p. 645-649. 10 refs. In Italian.

Formulation of a possible solution common to various problems of auditory perception, using the results of neuroelectrical tests performed by Frishkopf and Goldstein a few years ago (1963). Such a solution is based on the logic coincidence among several detectors and seems to be able to clarify the principal phenomena left unclarified by the experiments, namely, the different spontaneous emission among groups of nerve fibers, the inhibition mechanism of a tone by another, and the high value observed in the latency time. M.M.

A70-41997 New ocular hazard of mode locking in CW lasers. D. Smart (International Research and Development Co., Ltd., Newcastle-upon-Tyne, England), N. Manson (Royal Victoria Infirmary, Newcastle-upon-Tyne, England), J. Marshall, and J. Mellerio (London, University, London, England). *Nature,* vol. 227, Sept. 12, 1970, p. 1149, 1150. 5 refs.

Investigation of threshold retinal damage produced by CW helium-neon lasers. It was found that lasers with identical beam divergence and output powers but different amplifier/cavity parameters produce different amounts of retinal damage. The source of this discrepancy has been traced to mode locking in one of the lasers used. G.R.

A70-42024 Two forms of repair of DNA in mammalian cells following irradiation. M. M. Elkind (Brookhaven National Laboratory, Upton, N.Y.) and C. Kamper (National Institutes of Health, National Cancer Institute, Bethesda, Md.). *Biophysical Journal,* vol. 10, Mar. 1970, p. 237-245. 24 refs. AEC-sponsored research.

When Chinese hamster cells are lysed on top of an alkaline sucrose gradient, in time a fairly discrete DNA-containing molecular species is released from an apparently more complex material. Small doses of X-radiation speed the resolution of this complex while large doses degrade the material released from it. Incubation after irradiation reverses both effects. (Author)

A70-42151 Elastic bounce of the body. Giovanni A. Cavagna (Milano, Università, Milan, Italy). *Journal of Applied Physiology,* vol. 29, Sept. 1970, p. 279-282. 8 refs. Research supported by the Consiglio Nazionale delle Ricerche.

Study of the oscillatory motion of the body resulting from falling on the ground with the calf muscles in sustained contraction and without bending the knees. The stiffness of the elastic structures responsible for this bouncing motion is calculated from the frequency of the oscillations at three different values of the load on the leg, showing that stiffness increases with the load. From the three values of stiffness, the approximate trend of the force-extension curve of the elastic structures on which the body bounces is

determined. It is similar to that of the series elastic elements of the isolated muscle. The mechanical energy stored in these structures when stretched by a force comparable to that attained in running is roughly 6 km-m. This is an appreciable fraction of the external work performed at each step in level running (8 to 14 kg-m). V.P.

A70-42152 Localization of recording site in the esophagus by means of cardiac artifacts. D. Trop, R. Peeters, and K. P. van de Woestijne (Akademisch Ziekenhuis St. Rafaël, Laboratorium voor Longfunktieonderzoek, Louvain, Belgium). *Journal of Applied Physiology*, vol. 29, Sept. 1970, p. 283-287. 20 refs. Research supported by the European Community for Coal and Steel.

Investigation aimed at determining the level at which a 10-cm long esophageal balloon will record pressures. To this end, the morphology and localization of the cardiac artifacts over the whole length of the esophagus were studied first with a 3-cm and then with a 10-cm balloon. Comparison of the morphology of the cardiac artifacts recorded with the short and long balloon confirmed Milic-Emili, Mead, and Turner's (1961) conclusion that, in the sitting position, the measurement was performed at the top of the long balloon, as a result of the vertical pressure gradient observed in the esophagus. However, when the balloon is displaced to a higher level with more positive pressure than at the next lower level, the site of pressure recording remains at that lower level until, by further displacing the balloon, its top reaches a zone with more negative pressure. Then, the site of pressure recording shifts again toward the top of the balloon. In this way, a long balloon smooths out the local pressure irregularities, not because of an averaging effect, but because of the shifts in the recording site. This phenomenon, when present, occurs at several volume levels. This explains the better reproducibility of compliance values at different levels in the esophagus, as observed by Mead et al. (1955) with a long balloon. V.P.

A70-42153 * Influence of body position on regional pulmonary arterial-venous shunts in intact dogs. Ryo Katori, Dalmo deS. Amorim, Richard A. Theye, and Earl H. Wood (Minnesota, University, Rochester, Minn.). *Journal of Applied Physiology*, vol. 29, Sept. 1970, p. 288-296. 51 refs. Research supported by the American Heart Association; NIH Grants No. HE-3532; No. HE-4881; Grant No. NsG-327.

Simultaneous cuvette oximetry on blood from left and right pulmonary veins, aorta, and pulmonary artery demonstrated lower oxygen saturation of dependent pulmonary venous blood than that from the aorta and the more superior pulmonary vein. A positive correlation was demonstrated between vertical separation of the pulmonary vein sampling sites and difference in oxygen saturation of blood from the two sites when in supine and left decubitus positions. Desaturation of dependent pulmonary venous blood occurred at times when 99.6% oxygen was breathed and disappeared in less than 1 min, after a change in body position that placed the affected region superiorly in the thorax. These results are believed related to the effects of gravity on the thoracic contents that produce pleural pressures at or near zero at the dependent border of the lungs simultaneously with highly negative values at superior surfaces, resulting in a vertical gradient in size of the alveoli and terminal airways - a gradient that apparently can extend to complete collapse in the most dependent regions of the lungs. (Author)

A70-42154 Topography of pleural surface pressure above resting volume in relaxed animals. E. Agostoni, E. D'Angelo, and M. V. Bonanni (Ferrara, Università, Ferrara, Italy). *Journal of Applied Physiology*, vol. 29, Sept. 1970, p. 297-306. 12 refs. Research supported by the Consiglio Nazionale delle Ricerche; Contract No. AF 61(052)-67-C-0053.

Measurement of the topography of pleural surface pressure in paralyzed rabbits and dogs up to alveolar pressure of 20 to 25 cm H2O. The vertical gradient of transpulmonary pressure decreased by increasing Palv and became nil when Palv was about 9, 10, and 22 cm H2O in the supine, lateral, and head-up rabbit, respectively; when Palv was about 8 cm H2O in the eviscerated rabbit, both supine and head-up; and when Palv was about 13 and 22 cm H2O in the supine and head-up dog, respectively. The decrease of the vertical gradient has been tentatively interpreted in terms of regional differences in the compliance of the lung and of the chest wall, displacement of blood out of the chest cavity, decrease of lung weight per unit supporting area of pleural surface, increase of tensile rigidity of the lung, and increase of pleural surface pressure above body surface pressure ('pneumatic rigidity'). This latter condition, which is never met when the respiratory system is expanded by its muscles, seems essential to eliminate the vertical gradient. (Author)

A70-42155 Validity of skinfold and girth assessment for predicting alterations in body composition. Jack H. Wilmore, Robert N. Girandola, and Dorothy L. Moody (California, University, Berkeley, Calif.). *Journal of Applied Physiology*, vol. 29, Sept. 1970, p. 313-317. 25 refs.

The ability to estimate changes in body density (D sub b), specific gravity (SG), body fat, and lean body weight (LBW) through previously developed prediction equations based on various skin-fold and girth measurements was evaluated after a jogging-type training program. The subjects included 23 girls between 14 and 18 years of age and 55 men between 17 and 59 years of age. When compared to the underwater or hydrostatic weighing technique, the various prediction equations were found to be accurate with respect to their relative values, but their actual or absolute values were highly inconsistent. In addition, the actual changes in D sub b, SG, fat, and LBW were found to have only low-to-moderate correlations with the predicted changes. This suggests that the practice of using prediction equations to estimate actual changes in body composition parameters after physical training programs is basically unsound when used for research purposes. (Author)

A70-42156 Effect of respiratory pattern on alveolar gas exchange. J. H. Knelson, W. F. Howatt, and G. R. DeMuth (Michigan, University, Ann Arbor, Mich.). *Journal of Applied Physiology*, vol. 29, Sept. 1970, p. 328-331. 9 refs. PHS Grant No. 2-T1-HD-57-06; NIH Grant No. FR-0538-06.

Study in which respiratory pattern was altered in mechanically ventilated dogs by introducing an end-inspiratory pause of the same duration as that usually occurring after expiration. This change in pattern was followed by a rapid rise in Pa sub O2 (9.5%), a decrease in Pa sub CO2 (8.2%), and an increase in VA (20.3%). A high correlation between length of end-inspiratory pause and fractional increase in calculated alveolar ventilation was seen ($r = 0.85$, P less than 0.001). The observed effects can be predicted by a theoretical model which is presented. (Author)

A70-42157 Shifts in body fluids during dehydration in the burro, Equus asinus. M. K. Yousef (Desert Research Institute, Boulder City, Nev.), D. B. Dill (Nevada, University, Las Vegas, Nev.), and M. G. Mayes (U.S. Public Health Service, Southwestern Radiological Health Laboratory, Las Vegas, Nev.). *Journal of Applied Physiology*, vol. 29, Sept. 1970, p. 345-349. 22 refs. Research supported by the Nevada Heart Association; NSF Grant No. GB-7509; NIH Grant No. GM-15693-02.

Investigation of the mechanisms underlying the exceptional tolerance to dehydration in the burro. Two female burros were used for determining the different body fluid compartments before and after dehydration. The results demonstrate that dehydration for 48 hr including a 10-hr walk reduced body weight about 18%, and that the body water was lost chiefly from the intracellular fluid volume. The decrease in this volume was 30 and 33%, while the loss from extracellular fluid volume was 18 and 16%, and the decrease in plasma volume was 6 and 8% only. It is pointed out that the ability of the burro to conserve blood volume and presumably to maintain circulatory adequacy most likely explains its well-being even after 20% dehydration. The difference in water loss observed between the

two dehydrated burros is found to be behavioral and partly related to the time spent in the sun. The experimental results further show that rehydration was rapid and overhydration did not occur. Water content of feces of the dehydrated burros was similar to that of desert antelopes but greater than that of the camel's feces. O.H.

A70-42158 Serum enzymes after marathon running. Leslie I. Rose, James E. Bousser, and Kenneth H. Cooper (USAF, Aerospace Medical Laboratory /Clinical/ and Dept. of Pathology, Lackland AFB, Tex.). *Journal of Applied Physiology,* vol. 29, Sept. 1970, p. 355-357. 14 refs.

Lactate dehydrogenase (LDH), creatine phosphokinase (CPK), and LDH isoenzymes were measured in the serum of six conditioned male volunteers before and after a marathon run (26.2 miles, 41.86 km). Significant rises were noted in total LDH, total CPK, and LDH-3, -4, and -5. No significant change was found in LDH-1 and -2, the fractions found in cardiac muscle and kidney. This finding shows that the rise seen in serum LDH and serum CPK is not due to myocardial enzyme release and that as determined by changes in LDH isoenzymes, little, if any, damage occurs to the myocardium in conditioned subjects after the muscular exertion of a 26.2-mile (41.86-km) run. (Author)

A70-42159 Electrical and metabolic activities and fatigue in human isometric contraction. E. Kuroda, V. Klissouras, and J. H. Milsum (McGill University, Montreal, Canada). *Journal of Applied Physiology,* vol. 29, Sept. 1970, p. 358-367. 25 refs.

Experimental and theoretical study of the tripartite relationship between molecular oxygen consumption, EMG activity, and isometric force in human leg muscles. Force was measured by a meter especially designed for force exerted by anterior femoral muscles. EMG activity was determined by surface electrodes, by amplification, rectification, and integration. Molecular oxygen consumption was assessed by the open-circuit method. EMG and oxygen consumption measurements were taken at 100%, 75%, 50%, and 25% of maximum voluntary contraction. It was found that a 'linear-plus-exponential' relationship (best fitted in the usual least-square sense) was superior to the other several linear and polynomial relations tested for two of the bipartite relations (force-EMG; oxygen consumption-force) and not significantly inferior for the third relation (EMG-oxygen consumption). V.P.

A70-42160 Venous blood distribution in the legs during intermittent treadmill work. Carl Gisolfi (Iowa, University, Iowa City, Iowa) and Sid Robinson (Indiana University, Bloomington, Ind.). *Journal of Applied Physiology,* vol. 29, Sept. 1970, p. 368-373. 13 refs. Contract No. DA-49-193-MD-2449.

Determination of changes in the distribution of blood flow between the deep and superficial veins of the legs during alternating periods of hard to exhausting treadmill work and rest. During work, saphenous blood temperature (superficial vein) just below the knee of two of the three subjects rose sharply in a course parallel to the rise in femoral blood temperature (deep vein), indicating that both veins transport blood from the working muscles of the foot and lower leg. In the third subject, saphenous temperature either initially declined with the start of work and then rose, or it declined further in 2- to 5-min work periods, indicating that the saphenous vein and its branches were more constricted in this subject and drained less blood from the working muscles. These data are considered to show that during hard treadmill work a large fraction of the blood in the saphenous vein at knee level was coming directly from working muscles of the foot and lower leg. F.R.L.

A70-42161 Behavior of a muscular group subjected to a sinusoidal and trapezoidal variation of force. A. Berthoz (CNRS, Laboratoire de Physiologie du Travail, Paris, France) and S. Metral (Hôpital de la Pitié, Paris, France). *Journal of Applied Physiology,* vol. 29, Sept. 1970, p. 378-384. 41 refs.

Sinusoidal and trapezoidal variations of force have been applied to the forearm in man under visual control of limb position. When the applied force varies sinusoidally, a maximum oscillation of the limb occurs in the 3-5 cycles/sec frequency bandwith. Activity of flexors (biceps, brachii, brachoradialis), recorded by EMG, shows a phase lead with respect to stretch. Silent periods occur at each cycle during the shortening of the muscles. When the frequency of the applied force increases above 6 Hz, the displacement of the limb decreases. When successive loading and unloading are performed by trapezoidal stimulation the initial displacement of the limb is proportional to the logarithm of the rate of variation of the applied force. Oscillation of the limb occurs when unloading follows loading within approximately 200 msec, due to combining of passive mechanical and active neuromuscular effects. (Author)

A70-42162 A continuous blood oxygen analyzer. Max Jellinek, Hendrick B. Barner, and George C. Kaiser (St. Louis University, St. Louis, Mo.). *Journal of Applied Physiology,* vol. 29, Sept. 1970, p. 398-400. 8 refs. Research supported by the John A. Hartford Foundation and the Missouri-Saint Louis Heart Association; PHS Grant No. HF-06312.

The blood oxygen analyzer described in this paper outlines the standard reagents and the reaction of the Van Slyke manometric method adapted for the continuous flow with Technicon components. Quantitation of the gas is obtained by delivery of the oxygen in a carrier gas (nitrogen) to a Clark oxygen electrode. The use of the carrier gas permits standardization of the analyzer with atmospheric air so that readings obtained are in milliliters oxygen per volume of blood. The readings are independent of all other variables. The capability of this analyzer is demonstrated with continuous systemic and coronary sinus oxygen measurements during a 5-min occlusion of the left anterior descending coronary artery in the dog. (Author)

A70-42163 High-fidelity recording of cardiac depolarization. Gary J. Anderson, Kalman Greenspan, Jack P. Bandura, and Charles Fisch (Indiana University; Marion County General Hospital, Indianapolis, Ind.). *Journal of Applied Physiology,* vol. 29, Sept. 1970, p. 401-405. 11 refs. Research supported by the Indiana Heart Association and the American Medical Association; PHS Grants No. HE-6308; No. HTS-5363; No. HE-5749.

Study in which transmembrane action potentials were recorded with microelectrodes and simultaneously displayed at rapid oscilloscopic sweep speeds, thus making it possible to display the more rapid components (phase 0) of the action potentials. With a memory oscilloscope, accurately synchronized to the tape system or pulse generator, oscilloscopic sweep speeds up to 5 times 10 to the 7th mm/sec displaying phase zero could be attained, thus allowing careful examination of each component of the monophasic action potential. This technique also permits superimposition of action potentials either serially or at selected times, providing accurate comparison of data recordings. The determinants of accurate phase 0 recordings are those of adequate amplifier frequency response and accurate synchronization of data to oscilloscope. (Author)

A70-42242 # Variation of the lethal effect of irradiation with the aid of chemical compounds under conditions of cell cultivation outside the organism (Izmenenie letal'nogo effekta oblucheniia pri pomoshchi khimicheskikh soedinenii v usloviiakh kul'tivirovaniia kletok vne organizma). V. Ia. Gotlib, I. I. Pelevina, G. G. Afanas'ev, and L. P. Lipchina (Akademiia Nauk SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR). *Akademiia Nauk SSSR, Doklady,* vol. 192, June 21, 1970, p. 1367-1370. 7 refs. In Russian.

Study of the possibility of modifying the radiosensitivity of cells in a tissue culture with the aid of an inhibitor of radical reactions, propyl gallate. The cells investigated were cells of the LL strain, obtained from an ascitic lymphoid leukosis of NKLy mice. A

comparative study was made of the possibility of modifying the effect of irradiation on these cells with the aid of propyl gallate introduced 18 hours and 15 min before irradiation. It is shown that the introduction of propyl gallate 18 hours before irradiation considerably increases the radiosensitivity of a given cell population, while the introduction of propyl gallate 15 min before irradiation reduces the radiosensitivity of the cells. A.B.K.

A70-42287 A model for the elementary visual networks of the human brain. Robert J. Baron (Clarkson College of Technology, Potsdam, N.Y.). *International Journal of Man-Machine Studies,* vol. 2, July 1970, p. 267-290. 21 refs.

Description of a model for the elementary visual processing networks of the human brain. The model is based on two networks: information processing networks which scan, select, and transform regions of the visual field and deliver the resultant information patterns for storage, recognition and recall by the permanent memory store, and control networks which regulate the flow of information through and determine the specific transformation to be performed by the information processing networks. All decisions regarding information processing are made by the control networks. Specific emphasis is placed on the logic and control algorithms which govern the behavior of the system. Various clinical syndromes of the visual system are considered. It is shown that similar syndromes result from damage to the proposed model in a very natural way. Based on the model, a classification of various clinical syndroms is suggested which forms a reasonable basis from which to develop a better understanding of the mechanisms which underlie the syndromes. Computer simulations are described which show the behavior of the proposed model. O.H.

A70-42298 The cockpit checklist - Reliability, challenge, response. Bill Tymczyszyn (Flight Computers, Inc., Harbor City, Calif.). *Safe Engineering,* vol. 4, Aug.-Sept. 1970, p. 21, 22.

Discussion of the importance of automatic checklist systems in lieu of the conventional cockpit checklist on paper for corporate aircraft. The limitations of the conventional cockpit checklist on paper are pointed out and dramatized in the light of examples of nonaverted accidents. It is shown that, with the use of microminiature integrated circuitry, reliable, low-cost, low-weight automatic checklist systems are not only possible, but are already in fact available. The reason for the slowness of their acceptance in business aviation lies, it is felt, with the corporate pilot who is afraid to request added safety equipment for fear of a lessened image of himself as a pilot in the boss' eye. Prompt remedial action is urged. M.V.E.

A70-42301 # Aortic insufficiency - Estimation of the regurgitated flow by a dye technique (Insuffisance aortique - Estimation du flux regurgité par une technique au colorant). N. Salonikides, N. Gazetopoulos, P. Tsakonas, M. Manes, and S. Katsonis (Hôpital des Vétérans de l'Armée, Athens, Greece). (*Congrés Européen de Cardiologie, 5th, Athens, Greece, Sept. 8-14, 1968.*) *Acta Cardiologica,* vol. 25, no. 2, 1970, p. 165-174. 18 refs. In French.

Study of the value of a dye method for estimating the severity of aortic regurgitation, in comparison with angiocardiographic technique. The method is based on repeated injections of dye at intervals at the level of the descending aorta, in points which are progressively further distant from the anastomosis of the common left carotid. Dye-dilution curves are recorded from the left ear. There is a satisfactory correlation between the 'height' or the 'volume' of the cylinder of regurgitation defined by the dye technique, and the degree of regurgitation determined by cineangiocardiography. F.R.L.

A70-42316 # The role of structures of the cervical spinal cord in heat production to avert coldness (Die Bedeutung von Halsmarkstrukturen für die Wärmebildung bei Kälteabwehr). G. Berge and W. Kalkoff (Medizinische Akademie, Magdeburg, East Germany). *Acta Biologica et Medica Germanica,* vol. 24, no. 5, 1970, p. 657-672. 24 refs. In German.

Study of the localization and functional topology of thermosensible central nervous structures in the cervical spinal cord region in rats. Metabolic response to coldness was tested in 47 rats in 87 undercooling experiments under comparable conditions for the following two cases: when heat was allowed to develop due to muscular tremor, and when muscular activities had been eliminated by intersecting the spinal cord in the region of segment Th 1 and Th 2 (group a) or C 7 and Th 1 (group b). The two groups behaved quite differently: while group a, despite the paralysis below the intersection retained the ability of increasing the metabolism in the cold, group b animals failed to show any cold-induced metabolic reactions even under modified experimental conditions. Long-term core temperature controls show similar differences between the two groups. The results allow the conclusion that the increase in heat production following intersection of the spinal cord requires the integrity of the latter in the region of segment C 7 and Th 1. Functional correlations of this segmental region with other organs and structures relevant to the chemical thermogenesis are discussed. O.H.

A70-42457 Environment and human efficiency. E. C. Poulton (Medical Research Council, Cambridge, England). Research supported by the Royal Naval Personnel Research Committee. Springfield, Ill., Charles C. Thomas, Publishers (American Lecture Series, No. 765), 1970. 345 p. 264 refs. $15.50.

Recent research on human performance under environmental stress is summarized and interpreted, and the principles which underlie the experimental findings are explained. Following an introductory description of a simple model of the way in which the human brain performs and the principles and techniques of experimentation, a detailed review is presented of the various types of environmental stress which affect man's capabilities. This review is followed by a description of the main experimental results and what they mean. Methods of improving man's performance by preventing and reducing the effects of each particular environmental stress are given special emphasis. O.H.

A70-42458 Effect of high carbohydrate, protein, and fat diets and high altitude on growth and caloric intake of rats. David D. Schnakenberg and Roy F. Burlington (Fitzsimons General Hospital, Physiology Div., Denver, Colo.). *Society for Experimental Biology and Medicine, Proceedings,* vol. 134, Sept. 1970, p. 905-908. 19 refs.

Study of the effects of high carbohydrate, high protein, and high fat diets on the growth and caloric intake of rats exposed to high altitude. Diminished growth rates were observed in rats exposed to an altitude of 4300 m and fed diets high in either carbohydrate, fat or protein. This effect was attributed to altitude-induced anorexia and to alterations in nutrient utilization. It is pointed out that a high protein diet is apparently the least desirable for the support of growth in rats at high altitude. M.M.

A70-42459 High altitude and protein metabolism in the rat. George J. Klain and John P. Hannon (Fitzsimons General Hospital, Physiology Div., Denver, Colo.). *Society for Experimental Biology and Medicine, Proceedings,* vol. 134, Sept. 1970, p. 1000-1004. 34 refs.

Study of the activities of hepatic arginase and arginine synthetase and incorporation of alanine or glutamic acid into tissue proteins in rats exposed acutely or chronically to an altitude of 14,110 ft. Compared to the controls, activities of the two enzymes were significantly increased after 2 days but not after 30 days at altitude. By way of contrast, a decrease in amino acid incorporation into liver, spleen, duodenal, and adrenal proteins was observed in rats exposed to altitude for two days. Altitude for 30 days had no effect

on amino acid incorporation into tissue proteins. The data demonstrate an increase in protein catabolism during an acute exposure to hypoxia. M.M.

A70-42869 # **Automatic diagnosis of clinical electroencephalogram with a digital computer.** Ichiro Saito (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 10, Mar. 1970, p. 157-164. In Japanese, with abstract in English.

Description of experiments in which an electroencephalogram transmitted by dataphone or recorded in magnetic tape is digitized at the rate of 300 samples per sec and smoothed through the 9-point least square method. The maximum and minimum points are detected, and the duration and amplitude of each wave are calculated in series. Criteria are prepared for recognizing the basic pattern and paroxysmal wave, and a narrative diagnosis is printed. The amplitude and wavelength matrix, number of waves, mean amplitude of each classified wave, and the per cent duration of each classified wave are printed. M.M.

A70-42870 # **Characteristics of pilots on personality test. III Effects of age, grade, educational institution and test-taking attitude on the Y-G personality scales.** Sakurako Takigawa, Norimichi Takemoto, and Hayao Hori (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 10, Mar. 1970, p. 165-172. In Japanese, with abstract in English.

Comparison and discussion of the effects of age, grade, educational institution and test-taking attitude on the Yatabe-Guilford personality scales in 350 flying personnel. The main results are: (1) the younger the personnel, the more emotionally stable, adaptable, active and impulsive they were; (2) significant differences were found between military school graduates and three other graduate groups on inferiority and thinking introversion scales; and (3) no significant difference was found in the effect of test-taking attitudes of the same person on personality scales. M.M.

A70-42871 # **The influence of vibration on motor performance. II - The effect of longitudinal vibration on reaction time, manual control and working position.** Yuko Nagasawa, Hiroko Hagihara, Sadahito Aramaki, and Tomohiko Ito (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 10, Mar. 1970, p. 173-180. 7 refs. In Japanese, with abstract in English.

Experimental investigation of the effects of longitudinal vibration on human reaction time to toggle switch control, manual knob control, and task performance in several working positions. Some of the principal results obtained are: (1) human motor performance was generally affected by longitudinal vibration under conditions of peak acceleration; (2) few effects on motor performance were observed at the working position of about 35 cm as compared with a farther position at 60 cm or a nearer position below the subject's elbow. M.M.

A70-42872 # **Analysis of circadian rhythm in body temperature by Cosinor method.** Ryohei Yurugi (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 10, Mar. 1970, p. 181-187. 10 refs. In Japanese, with abstract in English.

Investigation of the application of the Cosinor method to the analysis of the circadian rhythm in the body temperature of healthy male and female subjects. Some of the experimental results are: (1) the Cosinor method may not be applicable to the analysis of body temperature in a narrow time span, including phenomena of morning rising, during a day; and (2) the Cosinor method may well be applicable to represent the general characteristics of circadian rhythm in body temperature by its amplitude and phase difference as a group. M.M.

A70-42873 # **Analyses of heart rate changes before, during, and after step-up exercise.** Nobuo Yuza, Chieko Sakakibara, Kiyoe Yano, Haruo Ikegami, and Ryohei Yurugi (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 10, Mar. 1970, p. 188-196. 10 refs. In Japanese, with abstract in English.

Mathematical analysis of heart rate-time curves before, during, and after step-up exercise, using computer techniques. Human cardiovascular response to exercise is discussed in relation to physical fitness. It was found that, in general, the relationship between the heart rate and time during or after exercise can be expressed by an exponential or logarithmic function which can easily be calculated by a modified least squares method. M.M.

A70-42874 # **Investigation on new simple calculating method for mean skin temperature of the human body.** Michihiko Iizuka and Ryohei Yurugi (Japan Air Self-Defense Force Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 10, Mar. 1970, p. 197-203. 6 refs. In Japanese, with abstract in English.

Calculation of mean skin temperatures by means of the 10-point method MST (10), from large quantities of skin temperature data obtained through cold and hot exposure in laboratory experiments. Correlations between MST (10), tentatively used as the standard skin temperature, and other calculated by simplified methods, were investigated. M.M.

A70-42876 # **A survey on troubles, frustrations and personality trends in jet-pilots, JASDF.** Sakurako Takigawa, Yukiko Kakimoto, and Hayao Hori (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 10, Dec. 1969, p. 121-130. In Japanese, with abstract in English.

Psychological investigation of jet pilots making use of a questionnaire with 250 items. A number of problem areas were found in connection with such subjects as issues related to personal problems and the spending of leisure time. On the other hand, rates of complaints regarding areas related to family, sex, and marriage were not so high. G.R.

A70-42877 # **EEG of jet-pilot during flight. II.** Ichiro Saito, Kunio Sakuma, Noriko Kato, and Masaru Goto (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 10, Dec. 1969, p. 131-133. In Japanese, with abstract in English.

Discussion of an experiment in which the EEG of a jet pilot during a flight was transmitted by telemeter. The contour map of the power-spectrum obtained shows that psychomotor stresses connected with takeoff and sudden acceleration suppressed the appearance of the alpha wave. G.R.

A70-42878 # **The results of physical examination on pilots. I.** Ichiro Saito, Shigeyuki Yagura, Yoshinori Kurihara, and Noriko Ishido (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 10, Dec. 1969, p. 134-141. 17 refs. In Japanese, with abstract in English.

Study of the effects of aging on a number of physical functions in pilots on the basis of medical examinations conducted during a period of six years. 485 jet pilots aged from 20 to 44 years were involved in the investigation. Body weight, Rohrer's index, and blood pressure showed a slight increase with age. However, the values obtained were within the range for average ordinary Japanese. The most remarkable changes were found in visual accommodation, which was found to decrease sharply above the age of 41 years. G.R.

A70-42879 # Analysis of tranquilizers and hypnotics by thin layer chromatography. Tomeko Ako (Japan Air Self-Defense Force, Aeromedical Laboratory, Tachikawa, Japan). *Japan Air Self Defence Force, Aeromedical Laboratory, Reports,* vol. 10, Dec. 1969, p. 142-149. 8 refs. In Japanese, with abstract in English.

Study of methods for analyzing tranquilizers and hypnotics from organs of rats by thin layer chromatography. On the basis of the results it is recommended that tranquilizers are to be developed by Silica-Rider as adsorbent and a mixed solvent as carrier. Hypnotics are developed by Wakogel B-10 as adsorbent and the mixed solvent of acetone and methylene chloride as carrier. G.R.

A70-42893 Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). Edited by I. V. Muravov (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR). Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969. 372 p. In Russian.

Contents:

Opening address (Vstupitelnoe slovo). D. F. Chebotarev (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR), p. 5, 6.

Motor activity in the regulation of functions of the organism during aging (Dvigatel'naia aktivnost' v regulirovanii funktsii organizma pri starenii). I. V. Muravov (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR), p. 9-49. 93 refs. (See A70-42894 22-04)

Muscular activity and functions of the aging organism (Myshechnaia deiatel'nost' i funktsii stareiushchego organizma). P. O. Astrand (Central Gymnastic Institute, Stockholm, Sweden), p. 83-92. 9 refs. (See A70-42895 22-04)

Characteristics of the adaptation of the cardiovascular system of individuals of various age under conditions of muscular activity (Osobennosti adaptatsii serdechno-sosudistoi sistemy lits raznogo vozrasta v usloviiakh myshechnoi deiatel'nosti). E. A. Pirogova (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR), p. 93-104. 50 refs. (See A70-42896 22-04)

Active recreation in the regulation of the motor function of individuals of various age (Aktivnyi otdykh v reguliatsii dvigatel'noi funktsii lits raznogo vozrasta). E. G. Ianenko and V. I. Mironov (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR), p. 115-126. 39 refs. (See A70-42897 22-04)

Mechanism of age-conditioned changes in muscular working capacity (Mekhanizmy vozrastnykh izmenenii myshechnoi rabotosposobnosti). V. V. Frol'kis (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR), p. 129-148. 12 refs. (See A70-42898 22-04)

Control of the organism's oxygen regimes under muscular activity conditions for individuals of various age (O regulirovanii kislorodnykh rezhimov organizma v usloviiakh myshechnoi deiatel'nosti u liudei raznogo vozrasta). A. Z. Kolchinskaia, V. S. Mishchenko, B. K. Guniadi, and Iu. V. Stepanov (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR), p. 149-163. 52 refs. (See A70-42899 22-04)

Influence of physical loads on certain aspects of the carbohydrate metabolism in ontogenesis (Vliianie fizicheskikh nagruzok na nekotorye storony uglevodnogo obmena v ontogeneze). L. N. Bogatskaia, V. P. Voitenko, and A. Ia. Litoshenko (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR), p. 164-173. 11 refs. (See A70-42900 22-04)

Investigation of the age-conditioned characteristics of cardiovascular-system function control during muscular activity by mathematical modeling techniques (Issledovanie vozrastnykh osobennostei regulirovaniia funktsii serdechno-sosudistoi sistemy pri myshechnoi deiatel'nosti metodami matematicheskogo modelirovaniia). S. F. Golovchenko (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR) and P. V. Vasilik (Akademiia Nauk Ukrainskoi SSR, Institut Kibernetiki, Kiev, Ukrainian SSR), p. 198-209. 24 refs. (See A70-42901 22-04)

Mechanisms of motor-visceral integration and aging of the organism (Mekhanizmy motorno-vistseral'noi integratsii i starenie organizma). M. R. Mogendovich (Meditsinskii Institut, Perm, USSR), p. 227-239. (See A70-42902 22-04)

Coronary disease, customary load, and working capacity (Koronarnaia bolezn', privychnaia nagruzka i rabotosposobnost'). M. J. Karvonen (Institute of Occupational Diseases, Helsinki, Finland), p. 251-261. 9 refs. (See A70-42903 22-04)

Evaluation of contemporary occupations involving physical labor on the basis of a comparison between the age-conditioned limits of professional working capacity and the functional level of the cardiopulmonary system (K otsenke sovremennykh zaniatii fizicheskim trudom s pomoshch'iu sopostavleniia vozrastnykh granits professional'noi rabotosposobnosti i urovnei funktsii kardiopul'monal'noi sistemy). E. I. Stezhenskaia and V. N. Bugaev (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR), p. 274-282. 8 refs. (See A70-42904 22-04)

Some age-related characteristics of the process of becoming a trained person (Nekotorye osobennosti razvitiia trenirovannosti v sviazi s vozrastom). R. E. Motylianskaia (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Fizicheskoi Kul'tury, Moscow, USSR), p. 304-311. (See A70-42905 22-04)

Hemodynamic indices for aged individuals engaging in physical exercises over a long period of time (Pokazateli gemodinamiki u pozhilykh lits, dlitel'no zanimaiushchikhsia fizicheskimi uprazhneniiami). V. N. Maksimova and S. A. Klepikova (Meditsinskii Institut, Kharkov, Ukrainian SSR), p. 318-323. 9 refs. (See A70-42906 22-04)

Contractive function of the myocardium in individuals of middle and advanced age under conditions of high physical loads (Sokratitel'naia funktsiia miokarda u liudei srednego i pozhilogo vozrasta v usloviiakh bol'shikh fizicheskikh nagruzok). V. S. Nesterov and N. N. Plenov (Meditsinskii Institut, Kiev, Ukrainian SSR), p. 355-362. 18 refs. (See A70-42907 22-04)

Problem of age-determined standards for the hemodynamic reaction to 80 per min walking motions in a lying position in healthy individuals (K voprosu o vozrastnykh normativakh gemodinamicheskoi reaktsii na nagruzku ShDL-80/min u zdorovykh liudei). Ia. F. Bomash (Institut Ekspertizy Trudosposobnosti i Organizatsii Truda Invalidov, Leningrad, USSR), p. 363-368. 19 refs. (See A70-42908 22-04)

A70-42894 # Motor activity in the regulation of functions of the organism during aging (Dvigatel'naia aktivnost' v regulirovanii funktsii organizma pri starenii). I. V. Muravov (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 9-49. 93 refs. In Russian.

Review of available material concerning the unfavorable influence of hypokinesis on physical development, muscular working capacity, and lifetime. An analysis of this material shows that muscular activity should be regarded as an important and necessary factor in regulating the functions of the aging organism. By using the selective and general stimulating effect of muscular activity, it becomes possible to prescribe specific physical exercises to achieve a desired effect. The choice of physical exercises to suit the needs of the organism, and the dosage of the applied effects are felt to be an effective means of using the stimulating and therapeutic-prophylactic effect of muscular activity for regulating the metabolism and the principal functional systems of the aging organism. V.P.

A70-42895 # Muscular activity and functions of the aging organism (Myshechnaia deiatel'nost' i funktsii stareiushchego organizma). P. O. Astrand (Central Gymnastic Institute, Stockholm, Sweden). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian

SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 83-92. 9 refs. In Russian.

Discussion of the influence of muscular activity on the functions of the organism, on the basis of the general principles of functional changes in muscular activity conditions. Particular attention is given to energetic processes, their relation to physical loads of various types, and the dependence of the processes on age and sex. Aerobic metabolism is judged in terms of oxygen consumption, while changes in the lactic concentration in the blood and oxygen deficiency are taken as the criterion of anaerobic changes. Maximum aerobic capacity is defined by highest oxygen consumption during maximum muscular effort, lasting from two to ten minutes, in which large groups of skeletal muscles participate. An investigation in which 350 subjects ranging from 4 to 65 years of age were examined showed that there exist authentic differences in the maximum aerobic capacity between boys and girls up to the period of sexual maturity, whereas in adult women, the maximum aerobic capacity constitutes only 70 to 75% of its value for men. Maximum oxygen consumption for men and women is observed between 18 and 20 years, decreasing gradually from there on. At the age of 65, oxygen consumption is roughly 7% of the consumption at the age of 25. Men of 65 and women of 25 have the same maximum oxygen consumption. A direct correlation is observed also between age and the maximum frequency of cardial contraction. V.P.

A70-42896 # **Characteristics of the adaptation of the cardiovascular system of individuals of various age under conditions of muscular activity (Osobennosti adaptatsii serdechno-sosudistoi sistemy lits raznogo vozrasta v usloviiakh myshechnoi deiatel'nosti).** E. A. Pirogova (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 93-104. 50 refs. In Russian.

Study of some aspects of the adaptation of the functions of the cardiovascular system of aging and old individuals to loads of various intensity. The study showed that the increment in heart contraction frequency during physical loads is appreciably greater for young individuals than for old ones performing the same amount of work. Vice versa, the value of this index during the first minute of the restoration period is substantially greater for aged individuals, the increase growing with the load intensity. This indicates that the restitution period after the performance of physical labor by old individuals cannot be regarded as a phase of passive changes occurring during the working process. It is shown that this period, in many of its traits, is not less active than the period prior to labor. V.P.

A70-42897 # **Active recreation in the regulation of the motor function of individuals of various age (Aktivnyi otdykh v reguliatsii dvigatel'noi funktsii lits raznogo vozrasta).** E. G. Ianenko and V. I. Mironov (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 115-126. 39 refs. In Russian.

Investigation of the possibility of using active recreation as a means of influencing the motor function of the aging organism. An analysis of the results obtained indicate that the nature of the influence of active recreation on the motor function is highly complex. Thus, the changes in muscular working capacity are related in a nonuniform and complex manner to the oxygen consumption level, which constitutes an accepted general index of the degree of perfection of the motor function and its adaptation to physical loads. The evidence is that active recreation should be considered as a factor whose action cannot be expressed in purely quantitative terms. The influence of active recreation can be understood only on the basis of a qualitative comparison between the various parameters of the motor function, associated with the vegetative system. V.P.

A70-42898 # **Mechanism of age-conditioned changes in muscular working capacity (Mekhanizmy vozrastnykh izmenenii myshechnoi rabotosposobnosti).** V. V. Frol'kis (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 129-148. 12 refs. In Russian.

Study showing aging of the organism is accompanied by the development of substantial changes in the various control links of muscular working capacity, such as a decrease in the intensity of restoration processes, a decrease in the lability of the myoneuralgic synapse, a weakening in the sympathetic neural effects on the limb vessels and an increase in their sensitivity to humoral factors, a decrease in trophic neural effects, and other factors. The drop in muscular working capacity and its age-conditioned characteristics are attributed to developments which take place in functionally labile nerve centers. V.P.

A70-42899 # **Control of the organism's oxygen regimes under muscular activity conditions for individuals of various age (O regulirovanii kislorodnykh rezhimov organizma v usloviiakh myshechnoi deiatel'nosti u liudei raznogo vozrasta).** A. Z. Kolchinskaia, V. S. Mishchenko, B. K. Guniadi, and Iu. V. Stepanov (Akademiia Nauk Ukrainskoi SSR, Institut Fiziologii, Kiev, Ukrainian SSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 149-163. 52 refs. In Russian.

Study of the various mechanisms through which parameters of the body oxygen are affected during muscular activity. Means through which pulmonary and alveolar ventilation and blood circulation may be controlled are also studied. The role of the oxygen parameters in ventilation and hemodynamic control is discussed. A schematic diagram of a hypothetical oxygen-regime control system, which includes ventilation control, circulation control, and control of the oxygen-binding properties of the blood, is presented and discussed. This system is assumed to use closed loop feedback control, open loop control, and control by anticipation of disturbances. V.P.

A70-42900 # **Influence of physical loads on certain aspects of the carbohydrate metabolism in ontogenesis (Vliianie fizicheskikh nagruzok na nekotorye storony uglevodnogo obmena v ontogeneze).** L. N. Bogatskaia, V. P. Voitenko, and A. Ia. Litoshenko (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 164-173. 11 refs. In Russian.

Investigation of age-conditioned shifts in the anaerobic energy-formation link with the aim of determining the adaptivity of the aging human organism to muscular activity. Tests with men of two age groups (19 to 28 and 66 to 80 years of age) for two types of muscular loads were carried out, in which the contents of lactate, pyruvate, and alpha-ketoglutorate in the blood were measured. The results indicate that the relation between the aerobic and anaerobic

mechanisms of energy supply to the muscles changes with aging. The contribution of anaerobic glycolysis to the energy supply of muscles increases with age. V.P.

A70-42901 # Investigation of the age-conditioned characteristics of cardiovascular-system function control during muscular activity by mathematical modeling techniques (Issledovanie vozrastnykh osobennostei regulirovaniia funktsii serdechno-sosudistoi sistemy pri myshechnoi deiatel'nosti metodami matematicheskogo modelirovaniia). S. F. Golovchenko (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR) and P. V. Vasilik (Akademiia Nauk Ukrainskoi SSR, Institut Kibernetiki, Kiev, Ukrainian SSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 198-209. 24 refs. In Russian.

Construction of a mathematical model, consisting of a system of four first-order differential equations, which describes the process of controlling the heart beat during muscular activity for individuals of various age. The model reflects the neutral and hormonal control circuits. The parameters of the model are obtained by comparing reference and experimental data. V.P.

A70-42902 # Mechanisms of motor-visceral integration and aging of the organism (Mekhanizmy motorno-vistseral'noi integratsii i starenie organizma). M. R. Mogendovich (Meditsinskii Institut, Perm, USSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 227-239. In Russian.

Study showing that active behavior of man and animal is made biologically possible by their inherent kinesophilia - a nervous mechanism ensuring a high level of motor activity. The brain possesses an internal stimulus to diversified movements and not to forced defensive responses alone. In its evolution, kinesophilia has progressed from an instinctive demand for energy release to purposeful behavior. It becomes weaker with advancing age, leading to an untrained state hypokinetic syndrome. An active motor regimen is, therefore, a preventive measure against the functional and morphological symptoms of aging, among which disintegration of motor and visceral functions is a major factor. It is shown that locomotor activity and proprioception (i.e., the mechanism of motor-visceral reflexes) plays an important part in the system of integration of vegetative functions. V.P

A70-42903 # Coronary disease, customary load, and working capacity (Koronarnaia bolezn', privychnaia nagruzka i rabotosposobnost'). M. J. Karvonen (Institute of Occupational Diseases, Helsinki, Finland). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 251-261. 9 refs. In Russian.

Discussion of epidemiological investigations conducted in Finland to study the causes of cardiovascular diseases among various groups of the population. The cholesterol content of the serum, the blood pressure level, and smoking were found to be factors promoting coronary disease. Pathological changes in the electrocardiograms of individuals with a sedentary way of life were found to be substantially more frequent than for individuals engaged in extensive physical activity. The average lifetime of Finnish sportsmen (skiing and running champions) exceeded by 7 years the average lifetime of individuals belonging to their age group. Professional physical activity, however, may be a factor enhancing the danger of developing coronary disease. V.P.

A70-42904 # Evaluation of contemporary occupations involving physical labor on the basis of a comparison between the age-conditioned limits of professional working capacity and the functional level of the cardiopulmonary system (K otsenke sovremennykh zaniatii fizicheskim trudom s pomoshch'iu sopostavleniia vozrastnykh granits professional'noi rabotosposobnosti i urovnei funktsii kardio-pul'monal'noi sistemy). E. I. Stezhenskaia and V. N. Bugaev (Akademiia Meditsinskikh Nauk SSSR, Kiev, Ukrainian SSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 274-282. 8 refs. In Russian.

Survey of the average and upper age limits of the working population of the USSR as a function of the type of occupation, and the load, rate, and rhythm of the work performed, and on the basis of the functional state of the cardiovascular and respiratory system of aged and young individuals in response to equal loads. Regression equations expressing the age-conditioned characteristics of these responses are obtained. The analysis indicates that the working loads to which aged individuals are exposed should not evoke a heart beat in excess of 115 beat/min, a pulmonary ventilation of more than 32 liters/min, and an oxygen consumption of more than 1587 milliliters/min. V.P.

A70-42905 # Some age-related characteristics of the process of becoming a trained person (Nekotorye osobennosti razvitiia trenirovannosti v sviazi s vozrastom). R. E. Motylianskaia (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Fizicheskoi Kul'tury, Moscow, USSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 304-311. In Russian.

Discussion of the effects of physical training on the performance of various systems in persons of different age groups. Special attention is given to the positive reactions of the morphological and functional characteristics of the vegetative system and blood circulation, respiratory and muscular activities and metabolic processes to properly dosed physical exercises and working loads. Also considered are the physical disorders caused in persons of various ages by physical overloads, such as myocardial hypertrophy, hypodynamia, and depression of the transport function of the blood circulation system. The effect of aging on the development of these conditions is noted. Bradycardia is considered to be an indication of the good physical fitness resulting from physical training. V.Z.

A70-42906 # Hemodynamic indices for aged individuals engaging in physical exercises over a long period of time (Pokazateli gemodinamiki u pozhilykh lits, dlitel'no zanimaiushchikhsia fizicheskimi uprazhneniiami). V. N. Maksimova and S. A. Klepikova (Meditsinskii Institut, Kharkov, Ukrainian SSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 318-323. 9 refs. In Russian.

Study of the response of the hemodynamic indices of aged physically fit individuals to physical loads corresponding to the age and fitness of the individuals. It is found that due to the morphological characteristics of the cardiovascular system, the hemodynamic indices vary widely for individuals of the same age

group and similar physical fitness. For young sportsmen and aged individuals engaging in regular physical training over a period of several years, the ratio of the minute volume to the beat volume of the blood approaches the value of unity. Hemodynamic parameters are seen to be well suited for use as functional indices of the circulatory system of aged sportsmen. V.P.

A70-42907 # Contractive function of the myocardium in individuals of middle and advanced age under conditions of high physical loads (Sokratitel'naia funktsiia miokarda u liudei srednego i *pozhilogo vozrasta v usloviiakh bol'shikh fizicheskikh nagruzok*). V. S. Nesterov and N. N. Plenov (Meditsinskii Institut, Kiev, Ukrainian SSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 355-362. 18 refs. In Russian.

Study of adaptation to physical strains in a group of scientists, physicians, engineers, and office workers 60 to 70 years old who adhered to a schedule of physical exercises, including gymnastics, lawn tennis, and 1 to 2 km runs, for a period of several years. The ballistocardiographic examinations made on the subjects before and after this period indicated an improvement of the cardiac activity in most subjects. The clinical investigations also indicated considerable differences in the adaptivity of the cardiovascular system of the subjects to physical stresses, depending on the initial conditions of their heart. It is observed in particular that the development of adaptation in subjects with arteriosclerosis of the left ventricle without circulatory disorders was associated with the hyperfunction of the right ventricle. The improvement of the functions of both ventricles is also noted in some subjects. V.Z.

A70-42908 # Problem of age-determined standards for the hemodynamic reaction to 80 per min walking motions in a lying position in healthy individuals (K voprosu o vozrastnykh normativakh gemodinamicheskoi reaktsii na nagruzku ShDL-80/min u zdorovykh liudei). Ia. F. Bomash (Institut Ekspertizy Trudosposobnosti i Organizatsii Truda Invalidov, Leningrad, USSR). In: Motor activity and aging; International Symposium, Kiev, Ukrainian SSR, April 16-19, 1968, Transactions (Dvigatel'naia aktivnost' i starenie; Mezhdunarodnyi Simpozium, Kiev, Ukrainian SSR, April 16-19, 1968, Materialy). (A70-42893 22-04) Edited by I. V. Muravov. Kiev, Akademiia Meditsinskikh Nauk SSSR, 1969, p. 363-368. 19 refs. In Russian.

Study of the hemodynamic reactions in a group of 120 healthy men and women 20 to 66 years old who performed walking motions in a lying position at a rate of 80 motion/min. An attempt is made to determine the characteristics changes with age in the minute blood circulation volume, average dynamic blood pressure, heart stroke blood volume, and peripheral resistance of the subjects. The average dynamic blood pressure is found to remain relatively stable in all subjects after the exercises. A stronger reaction of the heart stroke blood volume in men than in women and a greater dispersion of all these characteristics with age are also noted. The study was designed to provide data on the adaptation of the human organism to physical strain. V.Z.

A70-42942 * Patterns of atrioventricular conduction in the human heart. Andrew L. Wit, Melvin B. Weiss, Walter D. Berkowitz, Kenneth M. Rosen, Charles Steiner, and Anthony N. Damato (U.S. Public Health Service, Hospital, Staten Island, N.Y.). *Circulation Research,* vol. 27, Sept. 1970, p. 345-359. 25 refs. PHS-supported research; NASA Contract No. T-22416(G).

Atrial, His bundle (H), and ventricular electrograms were recorded by an electrode catheter in unanesthetized man. Conduction time through the atrioventricular (A-V) conduction system was subdivided into A-V nodal (A-H interval) and ventricular specialized conduction system (H-V interval). The right atrium was driven at a constant rate and the pattern of A-V conduction of premature atrial test impulses was determined as they occurred progressively earlier in the cardiac cycle. In the type 1 response, conduction delay and block were limited to the A-V node only. The type 2 response was characterized by progressive conduction delay in both the A-V node and ventricular specialized conduction system with block occurring in several instances in the latter. In the type 3 response there was also a progressive delay in A-V nodal conduction time, and a sudden marked delay in conduction in the ventricular specialized conduction system. Conduction block occurred distal to the His bundle depolarization. The relevance of conduction delay and block in the different regions of the A-V conduction system to the full recovery time and the relative, functional, and effective refractory periods of A-V conduction are indicated. (Author)

A70-42955 * Dental enamel - Detection of surface changes by ultrasound. Sidney Lees, Frank E. Barber, and Ralph R. Lobene (Forsyth Dental Center, Boston, Mass.). *Science,* vol. 169, Sept. 25, 1970, p. 1314-1316. 11 refs. Research supported by the Warner-Lambert Pharmaceutical Co. and the John A. Hartford Foundation; PHS Grant No. 1-SO-1-FR-05483; Grant No. NGR-22-027-001.

Evidence indicates that the tooth surface differs in structure from the enamel immediately beneath it, and particularly that the enamel rod type structure is minimal in the true natural surface. Furthermore, the rod ends appear to disappear with age after the eruption of the tooth. The thickness of the surface layer may be as much as 25 micrometers. Studies of caries incidence show a peak in the attack curve 2 to 4 years after eruption and a decline thereafter for all teeth. This information indicates that the mechanical structure of the tooth surface should be carefully studied. A highly useful means appears to be ultrasound since the specific acoustic impedance of highly mineralized tissue like enamel is strongly dependent on fraction volume mineralization and since nondestructive test techniques can be based on ultrasonics. An experimental demonstration of ultrasonic detection in vitro of tooth surface demineralization is given. (Author)

A70-42956 Limits of microbial existence - Temperature and pH. Thomas D. Brock and Gary K. Darland (Indiana University, Bloomington, Ind.). *Science,* vol. 169, Sept. 25, 1970, p. 1316-1318. 11 refs. NSF Grant No. GB-7815; AEC Contract No. C-00-1804-16.

Microscopic survey made to detect the presence of bacteria in hot springs of varying temperature and pH characteristics. It is revealed that in neutral and alkaline hot springs bacteria are found at temperatures up to the boiling point of water (92 to 100 C, depending on the altitude). In hot springs of increasing acidity the upper temperature limit at which bacteria are found decreases; at pH 2 to 3 the upper temperature limit is 75 to 80 C. Bacteria have thus been able to evolve with the ability to grow at either high temperature or high acidity, but not at both high temperature and high acidity. These results suggest that there are physicochemical limitations of the environment beyond which life is impossible. (Author)

A70-42973 * Methods used to monitor the microbial load of returned lunar material. Gerald R. Taylor, J. Kelton Ferguson, and Charles P. Truby (NASA, Manned Spacecraft Center, Preventive Medicine Div.; Brown and Root-Northrop, Houston, Tex.). *Applied Microbiology,* vol. 20, Aug. 1970, p. 271, 272.

Description of methods used to prepare lunar soil samples and procedures used to detect viable microorganisms. All inoculated solid media, with the corresponding uninoculated controls, were incubated in atmosphere-temperature combinations. For this purpose the plates, in groups of three, were placed into a specially designed controlled-environment enclosure. The lack of growth in any of these test systems may be interpreted in at least three ways. M.M.

A70-43136 # Influence of linear and angular accelerations on certain metabolic indices (Vliianie lineinykh i uglovykh uskorenii na nekotorye pokazateli obmena veshchestv). E. V. Lapaev, G. I. Pavlov, I. A. Sidel'nikov, Iu. F. Udalov, E. M. Iuganov, and N. A. Chelnokova. *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* July-Aug. 1970, p. 515-520. 18 refs. In Russian.

Investigation of the influence of lateral and angular accelerations on blood contents of sugar, urea, and free amino acids, and urine contents of nitrogen, urea, ammonia, free amino acids, and 4-pyridoxine acids. Tests were performed on 12 healthy young men. It is shown that the accelerations resulted in definite changes of the protein and vitamin metabolisms. A decrease of transaminase activity, increased general nitrogen excretion, and relative increases of replaceable acids and transanimation amino acids in the blood proved to be sufficiently specific indices of the effects of vestibular stimulation. T.M.

A70-43137 # Electroencephalogram dynamics during human sleep for normal and altered daily regimes (Dinamika elektroentsefalogrammy vo vremia sna cheloveka pri obychnom i izmenennykh sutochnykh rezhimakh). A. N. Litsov. *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* July-Aug. 1970, p. 521-529. 30 refs. In Russian.

Investigation of the EEG stages of sleep in 28 healthy subjects under different regimens of sleep and wakefulness. For normal daily regimens (8 to 23 hours of sleep), eight subjects exhibited typical EEG stages A, B, C, D, E, and PF, similar to those described by other authors for ordinary living conditions. Orthodox sleep comprised from 75 to 92% overall, while paradoxical sleep comprised from 8.3 to 36.1%. The highest incidence of the paradoxical phase was during the morning hours. Under strong alteration of the daily regimen (5 to 14 hours of sleep for eight people and 14 to 23 for 12 people), the distribution of the EEG stages was disturbed both qualitatively (predominance of superficial sleep) and quantitatively (its decreased duration). In the course of exposure to sustained altered regimes, a gradual qualitative and quantitative improvement of sleep was noted. T.M.

A70-43138 # Mechanism of the biological action of constant magnetic fields (O mekhanizme biologicheskogo deistviia postoiannykh magnitnykh polei). L. A. Piruzian, V. M. Glezer, V. A. Dement'ev, V. A. Lomonosov, and V. M. Chibrikin (Akademiia Nauk SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR). *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* July-Aug. 1970, p. 535-539. 42 refs. In Russian.

Survey of recent research concerning possible mechanisms of biological action by a constant magnetic field. Magnetic field effects on the electrical properties of axons are analyzed, together with effects involving disturbance of the spatial orientation of biomolecules. Attention is given to mechanisms playing a role in the action of constant magnetic fields on electrolytes and liquids included in the composition of organisms. It is shown that the identification of the primary influence of constant magnetic fields in many observed biological effects requires further experimental and theoretical research. T.M.

A70-43139 # Influence of laser radiation on the lipid content in the lens of the Rana temporaria frog (Vliianie lazernogo izlucheniia na soderzhanie lipidov v khrustalike travianoi liagushki). Iu. G. Simakov, L. M. Poluektova, and V. V. Popov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia,* July-Aug. 1970, p. 609, 610. 8 refs. In Russian.

Investigation of the influence of focused laser radiation (wavelength of 10,600 A) at energy doses of 0.12 and 0.18 J on the eye lens in adult Rana temporaria frogs. It is shown that the radiation causes annular cataracts in 50% of the cases. Cataract development is accompanied by increasing lipid content in the lens cortex and core, beginning on the third day and ending on the eleventh. Redistribution of the lipids occurs after the eleventh day, and they accumulate in the vacuoles of the affected lens regions. The main feature of lipid behavior during cataract development involves an equalization of the lens cortex and core coloration. In a total cataract, the core and cortex have an identical blue-gray coloring. T.M.

A70-43184 # Combined space and nuclear radiation effects. Wright H. Langham (California, University, Los Alamos, N. Mex.). In: American Nuclear Society, National Topical Meeting on Aerospace Nuclear Applications, Huntsville, Ala., April 28-30, 1970, Proceedings. (A70-43177 22-22) Meeting co-sponsored by NASA, the Southern Interstate Nuclear Board, and the Alabama Development Office. Huntsville, Ala., American Nuclear Society, 1970, p. 152-162. 11 refs.

Discussion of problems for manned space operations presented by the exposure of astronauts to cosmic radiation and to radiation from nuclear systems. It is pointed out that manned space operations contemplated during the next 10 to 20 years will involve longer missions than the Apollo series, and will employ nuclear systems. Adequate shielding to maintain crew exposures from nuclear plus space radiations within limits established for terrestrial occupational exposure appears wholly impractical because of weight considerations. Philosophical and technical questions regarding the establishment of acceptable radiation protection guides are discussed. Radiation effects relevant to space flight and the collection of the necessary quantitative data regarding these effects are considered. G.R.

A70-43375 * Fractional punishment of fixed-ratio performance. J. F. Dardano (Johns Hopkins University, Baltimore, Md.). *Journal of the Experimental Analysis of Behavior,* vol. 14, Sept. 1970, p. 185-198. 11 refs. PHS Grant No. MH-10542-01; Grants No. NsG-189-61; No. NGR-21-001-069.

Description of experiments in which the key-peck responses of pigeons were punished by response-dependent electric shocks. At high shock levels, the different loci of punishment affected differently the typical fixed-ratio performance pattern. Longer post-reinforcement pauses were observed under all punishment conditions but this effect was higher when the punishment was in the initial third of the fixed-ratio schedule of positive reinforcement. The general effects of all punishment conditions included consistent intrasession recoveries of partially suppressed performances, the rapid recovery of fixed-ratio performances after the punishment dependence was removed by complete suppression, and the facilitation of overall and/or local response rates of most subjects by low intensity shock. V.Z.

A70-43390 # Problem of the optimization of a magnetic radiation shield (K voprosu ob optimizatsii magnitnogo radiatsionnogo ekrana). K. A. Trukhanov and D. Kh. Morozov (Institut Mediko-Biologicheskikh Problem, Moscow, USSR). *Zhurnal Tekhnicheskoi Fiziki,* vol. 40, June 1970, p. 1229-1235. In Russian.

Optimization of a spacecraft magnetic radiation shield consisting of n superconducting frames positioned in radial planes around the cabin. Previous works considered optimization of the shield from the viewpoint of a minimum thickness criterion. In the present work, it is demonstrated that such a formulation of the problem is not always justified, since a reduction of shield thickness leads to a significant increase of the system mass. It is also shown that the mass is considerably dependent on the cutoff energy, and the latter is evaluated for some typical radiation shield arrangements. The cutoff energy is shown to lie below 70 to 100 MeV, and as a result it is possible to significantly reduce the shield weight without optimization on the basis of a thickness criterion. T.M.

A70-43401 Selective stimulus encoding and overlearning in paired-associate learning. Chaiyaporn Wichawut and Edwin Martin

(Michigan, University, Ann Arbor, Mich.). *Journal of Experimental Psychology*, vol. 85, Sept. 1970, p. 383-388. 17 refs. Contract No. AF 49(638)-1736.

Using a paired-associate list of three-word stimuli and one-word responses, together with a stimulated recall test, the nature of stimulus cue selection and inclusion was studied. Results obtained were that: (1) the number of selected cues increased with increasing degree of learning, (2) the effect of cue position was differential for different Ss, and (3) dependence among cues recalled, as well as between cues and responses recalled, was observed. It was concluded that stimulus cues are selected on a spatially determined attentional basis and that these cues are associated with the responses independently in a parallel fashion. (Author)

A70-43402 Preperceptual auditory images. Dominic W. Massaro (California, University, San Diego, Calif.). *Journal of Experimental Psychology*, vol. 85, Sept. 1970, p. 411-417. 17 refs.

The Ss were required to identify the pitch of a 20-msec test tone. In four experiments, the test tone was followed by a masking tone after a variable silent intertone interval. The masking tone interfered with the perceptual processing of the test tone such that pitch identification performance improved with increases in the silent intertone interval. The results also indicated that (1) the amount of interference produced by the masking tone was relatively independent of the similarity of the test and masking tones, (2) dichotic (contralateral) masking was as effective as the binaural case, and (3) presenting the masking tone before the test tone did not disrupt pitch-identification performance. The experiments are interpreted as a demonstration of the existence of a central auditory image that remains after a short tone burst is terminated. (Author)

A70-43403 A quantitative analysis of the spatial summation of excitation within the receptive field centers of retinal neurons. O.-J. Grüsser, Dagmar Schaible, and Jutta Vierkant-Glathe (Miami, University, Coral Gables, Fla.; Berlin, Freie Universität, Berlin, West Germany). *Pflügers Archiv*, vol. 319, no. 2, 1970, p. 101-121. 22 refs. Research supported by the Deutsche Forschungsgemeinshaft; PHS Grants No. NB-07575; No. NB-06787.

Discussion of the spatial summation of excitation within the receptive field centers of retinal neurons on the basis of tests in which the action potentials of single optic tract fibers in light-adapted cats were recorded. It is found that the spatial summation of the response of on-center and off-center neurons to one, two, three, and four-spot illumination does not support a hypothesis of linear spatial summation and lateral interaction within the receptive field. The summing properties of on-center neurons in the receptive field center are best described by models with multiplicative, lateral forward inhibition within the receptive field center. The experimental results indicate that the nonlinear spatial summation of excitation within the receptive field center is dependent on the temporal properties of the stimulus pattern. G.R.

A70-43404 Activity changes in spinal neurones during and after asphyxiation (Aktivitätsänderungen spinaler Neurone während und nach einer Asphyxie). E.-J. Speckmann, H. Caspers, and W. Sokolov (Münster, Universität, Münster, West Germany). *Pflügers Archiv*, vol. 319, no. 2, 1970, p. 122-138. 26 refs. In German. Research supported by the Deutsche Forschungsgemeinschaft.

Study of the effect of asphyxiation on the membrane potential (MP), on postsynaptic potentials (PSPs) and on the discharge frequency (DF) of lumbar neurones in rats. The bioelectric activity changes were related to the fluctuations of the oxygen pressure and the carbon dioxide pressure. It was found that at the onset of asphyxiation all lumbar neurones tend to depolarize. As a rule, the lowering of the MP is associated with an increase of excitatory PSPs and with a rise of DF. This initial effect can be attributed to oxygen deficiency. Two types of neuronal responses which can be differentiated with continued respiratory arrest and after reventilation are described. G.R.

A70-43405 Antagonistic changes of blood flow and sympathetic activity in different vascular beds following central thermal stimulation. I. R. Kullmann, W. Schönung, and E. Simon (William G. Kerckhoff-Herzforschungsinstitut, Bad Nauheim; Giessen, Universität, Giessen, West Germany). *Pflügers Archiv*, vol. 319, no. 2, 1970, p. 146-161. 42 refs.

Discussion of experiments designed to evaluate regional changes of blood flow distribution during thermal stimulation of the spinal cord and to compare the results with previous observations under the conditions of external and hypothalamic thermal stimulation. Blood flow in arteries mainly supplying cutaneous, muscular or intestinal vascular regions and aortic blood flow were measured with an EM flowmeter in anesthetized dogs immobilized with succinyl choline. It is assumed that the antagonistic changes of blood flow in the cutaneous and intestinal vascular beds observed were induced by antagonistic changes of sympathetic vasoconstrictor activity. G.R.

A70-43406 Antagonistic changes of blood flow and sympathetic activity in different vascular beds following central thermal stimulation. II. O.-E. Walther, M. Iriki, and E. Simon (William G. Kerckhoff-Herzforschungsinstitut, Bad Nauheim; Giessen, Universität, Giessen, West Germany). *Pflügers Archiv*, vol. 319, no. 2, 1970, p. 162-184. 42 refs.

Discussion of tests conducted with anesthetized rabbits and cats immobilized with succinyl choline in which the discharges of sympathetic efferents supplying cutaneous and visceral regions were simultaneously recorded. The effect of thermal stimulation of the spinal cord on regional sympathetic activity was tested on the basis of the integrated discharges. On the basis of the results obtained it is suggested as a working hypothesis that the sympathetic nervous system may perform under special conditions a sort of 'reciprocal innervation' of functionally antagonistic autonomic effector systems. G.R.

A70-43408 Binocular addition of the visually evoked response with different stimulus intensities in man. L. Cigánek (Slovak Academy of Sciences, Institute of Normal and Pathological Physiology, Bratislava, Czechoslovakia). *Vision Research*, vol. 10, June 1970, p. 479-487. 25 refs.

Investigation of the binocular addition of visual evoked responses (foveal-cone and peripheral-rod responses) to high intensity and very dim flashes. The increase in size from monocular to binocular responses to bright flashes was found to be only 40 per cent in average, while the same increase for dim flashes was 100 per cent or more. The reduction of VER amplitude in binocular addition for foveal-cone responses to bright flashes is explained by the occlusion effect of cone signals projecting by uncrossed as well as crossed pathways to both hemispheres and converging on the same cortical neurons. The occlusion effect being absent in unihemispheral afferentation of peripheral rod signals, the binocular addition of the latter results in the 100 per cent effect. T.M.

A70-43409 Subjective estimates of colour attributes for surface colours. I. G. H. Ishak, H. Bouma, and H. J. J. van Bussel (Institute for Perception Research, Eindhoven, Netherlands). *Vision Research*, vol. 10, June 1970, p. 489-500. 38 refs.

Description of experiments in which subjective estimates of hue, saturation, and lightness were given by two observers for sixty colored Munsell samples shown against seven backgrounds (black, gray, white, red, yellow, green, and blue). In the subjective estimation method, the observer simply views the test sample and assigns numbers or names to it which correspond to attributes of its subjective appearance. The results obtained show the adequacy of this method for studies on color appearance. The standard deviations of single estimates were quite acceptable. It was also found that the estimates are not always linearly related to the Munsell notations. The shifts due to chromatic surroundings are in accordance with the results obtained by other investigators. T.M.

A70-43410 **Color naming of small foveal fields.** Carl R. Ingling, Jr., Horst M. O. Scheibner, and Robert M. Boynton (Rochester, University, Rochester, N.Y.). *Vision Research,* vol. 10, June 1970, p. 501-511. 13 refs. NIH Grant No. NB-00624.

Experimental study of the dichromacy of the central fovea using a color naming technique. It is shown that the central fovea is not dichromatic although it tends to tritanopia. The trichromacy can be eliminated by presenting the test flashes against a bright blue background. More nearly normal responses are obtained by increasing the intensity and/or retinal eccentricity of the stimulus. Support is given for Brindley's hypothesis that dichromatic color matching for small foveal fields is due to a selective adaptation of the blue-mediating system which occurs during fixation. T.M.

A70-43411 **Foveal border-contrast.** W. H. Payne (Washington State University, Pullman, Wash.). *Vision Research,* vol. 10, June 1970, p. 513-518. 17 refs.

Investigation of foveal thresholds to a small flash of light at the center of a white, high luminance, circular disk on a black background. These were low when the disk radius was small (less than 0.72 min). Thresholds increased as the disk radius rose to a critical value (2.90 min) and then decreased again and leveled off (the sensitization effect). It is shown that a border of sufficient thickness (10.15 min) around a disk of critical radius is needed for the effect, and that border inhibition effects add linearly to suppress the test flash brightness. F.R.L.

A70-43412 **Spectral sensitivity with the freely moving eye.** Dean Yager (Brown University, Providence, R.I.). *Vision Research,* vol. 10, June 1970, p. 521-523.

Confirmation of the effect of a forced choice method of studying spectral sensitivity with the freely moving eye, based on data from a thesis by Thorpe (1970). Results show that the original data did not arise because of inadequate stimulus control or calibration, nor was the observer atypical, although the viewing conditions were. F.R.L.

A70-43425 * # **Search for life on the moon (Poiski zhizni na lune).** Cyril Ponnamperuma (NASA, Ames Research Center, Moffett Field, Calif.). *Priroda,* no. 8, 1970, p. 61-65. In Russian. (Translation).

Abridged version of a lecture made by the author (an American chemist) at the Bakh Institute of Biochemistry on May 5, 1970, in Moscow. In this lecture the author described studies of lunar rock samples conducted by a team of NASA scientists in an attempt to establish the presence of life on the moon. The samples were collected by astronauts on July 21, 1969, in the Sea of Tranquillity area. General approaches to the achievement of the goal of these studies are outlined. A chart showing the analytical procedures applied, including mass spectrometry and isotopic, fossil, carbon, and mineralogical analyses, is given. The prospects of obtaining a positive proof for the presence of life on the moon are considered dim. V.Z.

A70-43483 **Computer analysis of the electrocardiogram - Evaluation of experience in a hospital heart station.** Patrick A. Gorman and John M. Evans (George Washington University, Washington, D.C.). *American Heart Journal,* vol. 80, Oct. 1970, p. 515-521. 9 refs. PHS Contract No. PH 86-62-213.

Review of experience during one year of the use of a computer system for ECG interpretation. In a detailed study of 647 consecutive computer-analyzed ECGs reviewed by a physician, 469 were abnormal and 178 normal. In the abnormal group there was complete agreement in 75.1%, partial disagreement in 21.5%, and complete disagreement in 3.4%. In the normal group there was agreement in 97.8% and disagreement in 2.2%. These results show significant improvement over comparable data obtained one year previously. The current place for computer-derived ECG interpretation in a hospital heart station, in which abnormal ECGs predominate, is to provide a preliminary analysis for subsequent review by a physician. The computer system must be sufficiently accurate to ensure reliable analysis of all but unsatisfactory data or complex abnormalities. M.M.

A70-43484 * **Effects of the Valsalva maneuver on the cardiac systolic intervals - Beat-to-beat versus timed analysis.** Athanassios P. Flessas, Sudarshan Kumar, and David H. Spodick (Lemuel Shattuck Hospital; Boston University, Boston, Mass.). *American Heart Journal,* vol. 80, Oct. 1970, p. 552-531. 30 refs. Grant No. NGR-22-012-066.

Comparison of the beat-to-beat effects of the Valsalva maneuver (VM) on the principal systolic cardiac intervals with the corresponding time-based measurements. Beat-to-beat and timed measurements of Valsalva-induced changes in pre-ejection period (PEP), left ventricular ejection time (LVET), and heart rate (HR) were made in 11 normal volunteers. HR followed the classic pattern. PEP and its components tended to be stable, reflecting mutual cancellation of opposite effects of HR and stroke volume. Following strain, LVET fell and remained low until just after release and departed widely from predicted values for the corresponding heart rates, reflecting its primary dependence on stroke volume rather than HR. Beat-to-beat analysis of changes in LVET and HR showed less variability among subjects than did time-based determinations of the same points. M.M.

A70-43492 **Visual target tracking with active head rotation.** Noboru Sugie (Ministry of International Trade and Industries, Electrotechnical Laboratory, Tokyo, Japan) and Makoto Wakakuwa (Nippon Pulse Motor Co., Ltd., Tokyo, Japan). *IEEE Transactions on Systems Science and Cybernetics,* vol. SSC-6, Apr. 1970, p. 103-109. 5 refs.

Visual target tracking during active head movements is investigated. Transient response and frequency response both indicate that the eye tracking behavior relative to the target is independent of head movement. The explanation of this phenomenon is pursued. It seems most likely that the vestibulo-ocular reflex, the eye movements elicited by head rotation, plays an essential role. Compensation for head motion is accomplished by this reflex at relatively high frequencies, making visual fixation on stationary objects quite easy. The dynamics of head motion are also investigated. Unusual nonlinear responses are found at high frequencies. Namely, the response frequency is slightly lower than that of the target. A model of the whole system is proposed. (Author)

A70-43494 **Studies in postural control systems. I - Torque disturbance input.** Gyan C. Agarwal (Illinois, University; Presbyterian-St. Luke's Hospital, Chicago, Ill.), Bradley M. Berman (Nebraska, University, Omaha, Neb.), and Lawrence Stark (California, University, Berkeley, Calif.). *IEEE Transactions on Systems Science and Cybernetics,* vol. SSC-6, Apr. 1970, p. 116-121. 13 refs. Grant No. NB 0014-67-A-0185.

Study of the postural control system in normal humans by applying a mechanical torque disturbance to the system. The disturbance was applied by either dropping a pendulum or by a torque motor. It is shown that the response of the system can be approximated by a second-order differential equation where the parameters depend on the state of the system. In the pendulum experiments, the viscosity and stiffness coefficients increase as the muscles become more tense. The parameter values in these experiments on different subjects and different mode of inputs are in good agreement. Difficulties in the analysis of such a complex system with this type of input-output behavior are discussed. M.M.

A70-43495 **Studies in postural control systems. II - Tendon jerk input.** Gyan C. Agarwal (Illinois, University;

Presbyterian-St. Luke's Hospital, Chicago, Ill.), Bradley M. Berman (Nebraska, University, Omaha, Neb.), Peter Löhnberg (Technische Hogeschool Twente, Enschede, Netherlands), and Lawrence Stark (California, University, Berkeley, Calif.). *IEEE Transactions on Systems Science and Cybernetics,* vol. SSC-6, Apr. 1970, p. 122-126. 14 refs. Research supported by the W. Clement Stone Foundation; Grant No. NB0014-67-A-0185.

Study of the postural control system in normal humans by applying a tendon jerk disturbance to the system. A stretch reflex was elicited in the gastrocnemius-soleus muscle by a tap on the Achilles tendon. It is shown that the initial conditions and the stimulus have strong influence on the reflex response. M.M.

A70-43496 Studies in postural control systems. III - A muscle spindle model. Gerald L. Gottlieb, Gyan C. Agarwal (Illinois, University, Presbyterian-St. Luke's Hospital, Chicago, Ill.), and Lawrence Stark (California, University, Berkeley, Calif.). *IEEE Transactions on Systems Science and Cybernetics,* vol. SSC-6, Apr. 1970, p. 127-132. 22 refs.

Description of a linear lumped-parameter mechanical model of the muscle spindle. It is shown that the model simulation on a digital computer exhibits the spindle behavior in most aspects of transient ramp-stretch performance. The requirements that such a model places on the mechanisms of fusimotor control are discussed. M.M.

A70-43522 * # Ultrasonic bone density measurements. James M. Hoop and W. N. Clotfelter (NASA, Marshall Space Flight Center, Huntsville, Ala.). *American Society for Nondestructive Testing, Fall Conference, Cleveland, Ohio, Oct. 19-22, 1970, Paper.* 17 p.

Development of reliable instrumentation for the measurement of ultrasonic velocity in human bones, and correlation of ultrasonic velocity changes with calcium content or density variations in the bones. The first objective has been achieved with the development of the laboratory instrumentation and experimental procedures described. Sufficient work has been accomplished to indicate that this type of instrumentation and procedures will be useful for monitoring the bone density of astronauts. But this capability has not been proven due to inadequate facilities for such proof. It can only be proven under test situations which truly simulate the measurements to be made. This means that the same bones must be monitored during a period of significant calcium loss or gain. Only in this manner can the second objective be fully achieved. M.V.E.

A70-43528 # Methods of studying the influence of accelerations on the human organism (Metody badań wpływu przyspieszeń na organizm ludzki). Zbigniew Jethon. *Technika Lotnicza i Astronautyczna,* vol. 25, Aug. 1970, p. 1-4. 5 refs. In Polish.

General outline of the effects of accelerations on the human organism, and classification of accelerations in terms of their orientation. Acceleration simulators used in tolerance studies are described, including centrifuges, rocket sleds, and catapults. Centrifuge tolerance study programs are discussed with emphasis on the difficulties encountered in comparing results obtained from different programs. The possibility of replacing costly centrifuge studies by functional tests is evaluated. T.M.

A70-43551 # Use of amplitude analyzers in time analysis of the pulsed activity of neurons (Ispol'zovanie amplitudnykh analizatorov dlia vremennogo analiza impul'snoi aktivnosti neironov). I. A. Zhuravin and B. F. Tolkunov (Akademiia Nauk SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR). *Fiziologicheskii Zhurnal SSSR,* vol. 56, June 1970, p. 932-935. 8 refs. In Russian.

Description of an assembly which uses an amplitude analyzer for recording the time-variable pulsed activity of neurons. The analyzer is directly controlled by an addressing system with a control unit which shapes counting pulses from neuron discharges, blocks the measuring circuit of the analyzer, and performs other functions producing a pulse-sequence recording cycle. The assembly is an improved version of a previous assembly. It can be programmed to produce pulse interval histograms, post-stimulus histograms, latent-period histograms, or expected pulse density histograms. V.Z.

A70-43553 # An electrocardiogram simulator (Imitator elektrokardiogramm). I. D. Pupko, V. K. Dolgov, and A. R. Keiver (Leningradskii Institut Tochnoi Mekhaniki i Optiki, Leningrad, USSR). *Priborostroenie,* vol. 13, no. 6, 1970, p. 19-23. In Russian.

Consideration of methods of designing devices for simulating the bioelectric activity of the myocardium. A block-diagram of an electrocardiogram simulator is presented, and a description is given of the operation of this device. An oscillogram of a simulated electrocardiogram, obtained with the aid of the proposed simulator, is also presented. A.B.K.

A70-43635 # Effects of space flight factors on systemic and tissue circulation. E. Il'in and S. Nikolaev (Akademiia Nauk SSSR, Moscow, USSR). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 192-201. 20 refs.

Discussion of data obtained in experimental studies of animal circulatory systems performed on board the Cosmos 110 biosatellite and under laboratory conditions. The satellite experiments concerned cardiac activity regulation in two dogs. Pulse rate variations during different stages of flight are characterized, together with peculiarities in the durations of the ejection stage and the isometric stage. The observed altered myocardial contraction confirms that the heart functions more economically in orbital flight, being very similar in pattern to the syndrome of cardiac hypodynamics. Post-flight symptoms are interpreted, and the effects of prolonged diminution of muscular activity are analyzed on the basis of laboratory results. Disturbances in brain circulation during weightlessness are described, and interactions between the systemic and tissue circulation are treated. T.M.

A70-43636 # The micro-climate of an orbiting manned laboratory. Hans G. Clamann (USAF, Aerospace Medical Div., Brooks AFB, Tex.). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 202-210.

Summary of currently available medical data on the effects of space environmental factors on the human organism, from the viewpoint of the preferred microclimate for an orbiting manned laboratory. Factors affecting the selection of the proper mixture and pressure for a spacecraft atmosphere are detailed, and the relative merits of various oxygen, nitrogen, and helium compositions are evaluated. The maintenance of suitable temperature and humidity is considered in terms of technical complexity, and the numerous effects of weightlessness are outlined. Atrophy of muscles and decalcification of bones are illustrated by data for some Gemini missions. The problem of radiation damage is viewed from the point of orbital solutions, and some cumulative effects of radiation exposure are discussed. The necessity of creating protection against on-board noise is also treated. T.M.

A70-43637 * # The effects of breathing low concentrations of CO2 on exercise tolerance. S. Finkelstein, J. C. Elliott, and U. C. Luft (Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.). In: International Academy of Astronautics,

Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 211-221. Contract No. NAS 9-7009.

Attempt to detect and quantitate the effects of low concentrations of carbon dioxide on the exercise tolerance of man under controlled conditions on an ergometer. Reports of physical exhaustion experienced by astronauts during extravehicular activities while possibly rebreathing certain amounts of carbon dioxide stimulated the study. A latin square experimental design was set up to randomize treatments and allow each subject to be his own control. The experimental variable was the addition of carbon dioxide to the inspired mixture to produce a partial pressure of about 15 mm Hg. It was found that low concentrations of carbon dioxide in the inspired gas, while physiologically indifferent at rest, produced marked hyperpnea during the submaximal exercise, and a significant decrement in aerobic capacity. F.R.L.

A70-43638 # **Comments and review of decompression hazards in manned orbiting systems.** Richard W. Bancroft (USAF, School of Aerospace Medicine, Brooks AFB, Tex.). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 223-229. 15 refs.

Results of studies on dogs and chimpanzees of the effects of decompression and exposure to vacuum. Of particular importance are (1) time of consciousness in vacuum conditions, (2) survival time after loss of consciousness with particular reference to the time available for rescue and repressurization, (3) pathologic effects of such an episode in terms of irreversible damage to the central nervous system and other vital organs, (4) effect of water vapor and other evolved gases, (5) effect of denitrogenation or preoxygenation before decompression, and (6) optimum recompression rates and environmental gas composition to ensure the best chance for survival. The time for useful consciousness after a rapid decompression to a vacuum may be not more than about 10 sec and, with exercise, considerably less. The feasibility of developing adequate emergency rescue techniques appears to be promising within limits. Denitrogenation or prebreathing with oxygen appears to provide a significant amount of protection. F.R.L.

A70-43639 # **Rapid decompression.** Ulrich C. Luft (Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 230-242. 6 refs.

Discussion of the effects of sudden loss of pressure in a space vehicle or suit due to structural failure or external impact. Such loss of pressure might jeopardize the lives of the astronauts from fulminating hypoxia, the mechanical trauma of rapid decompression, and ebullism or boiling of body fluids. Experimental and practical experience indicates that of the several biological hazards in sudden decompression, fulmination hypoxia is the single most important factor due to inevitable loss of consciousness in less than 15 sec, and irreversible cerebral damage in 3 to 4 min. F.R.L.

A70-43640 # **Bends management in space flight.** Robert G. McIver (USAF, Aeromedical Research Laboratory, Holloman AFB, N. Mex.). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 243-250. 19 refs.

Consideration of measures which could be utilized in order to minimize the morbidity from decompression sickness until an abort of the mission could be effected or, in the extreme situation, in which mission abort was not possible. Any flight in which a subject develops signs of severe decompression sickness such as neurological symptoms, circulatory symptoms, chokes, paresthesias, or intolerable joint pains should be aborted. If mild symptoms of decompression sickness appear, the combination of suit pressure and cabin pressure should be used while the subject is breathing 100% oxygen. F.R.L.

A70-43641 # **Some aspects of the biological compatibility problem as related to crew change in long-duration space operations.** Y. G. Nefedov, V. P. Savina, S. N. Zaloguev, and A. A. Veselova (Akademiia Nauk SSSR, Moscow, USSR). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 252-259.

Discussion of the problem of 'biological compatibility,' which is important in servicing space objects with periodic crew change, especially as regards the biomedical control of crewmen in orbital and planetary stations of long duration. The environment of a hermetically sealed space cabin of limited volume, which man has occupied for a period of time, is to a large extent a product of human metabolic processes. Therefore, individual metabolic differences between crew members of a spacecraft can lead to cabin atmosphere contamination by some volatile components that are alien to other individuals. Particular attention in this respect should be given to individual differences in autoflora and the interchange of parts of individual autoflora between the people. Increased pathogenic properties of microorganisms, due to specific conditions of sealed cabin environments, can be of considerable importance. The results of sanitary-hygienic and medicophysiological experimental investigations are presented. The peculiarities of both the subjects' overall reaction and that of the main body physiological systems are described in detail. F.R.L.

A70-43642 # **Exposure limits of non-human primates to carbon dioxide.** J. L. Mattsson and J. M. Stinson (USAF, Aeromedical Research Laboratory, Holloman AFB, N. Mex.). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 260-271. 7 refs.

Results of exposing six undrugged rhesus monkeys to carbon dioxide at concentrations that rose from ambient to very high levels. The purpose was to better define the hazards of accidental exposure to increased carbon dioxide concentrations. Carbon dioxide-induced narcosis occurred at environmental partial pressure of carbon dioxide of 106 plus or minus 10 mm Hg. Monkeys were able to survive environmental carbon dioxide concentrations of 60% at 4300 ft altitude. Increased carbon dioxide produced a marked rise in respiratory rate between ambient air and 10% carbon dioxide, and also produced a profound fall in body temperature. F.R.L.

A70-43643 # **Concept of dynamic spacecraft cabin atmospheres.** Oleg G. Gazenko (Akademiia Nauk SSSR, Moscow, USSR). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Manage-

ment Branch, 1970, p. 272-276.

Description of some ideas formulated in the USSR in the last few years in regard to philosophies concerning cabin atmospheres for extended spacecraft operation. In long spaceflight exposures it seems practical to make relatively small changes in the gas composition. A series of experiments have been conducted which demonstrated that this procedure can be used effectively in reducing some of the unwanted effects of weightlessness and a number of other stress factors which occur during space flight. F.R.L.

A70-43644 * # **Orbiting biotechnology laboratory requirements.** Robert W. Dunning (NASA, Office of Advanced Research and Technology, Washington, D.C.). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 277-308. 16 refs.

Description of current concepts of the requirements for an orbital research laboratory to study man in space. The systems involved are called biomedical, man systems integration, life support and protective systems, and bioscience. Categories examined are objectives, measurements and observations, experiment duration, subjects, materials and equipment, personnel required, and special requirements. Attempts to optimize and reduce the physical requirements of an orbiting laboratory yielded an integrated medical and behavioral laboratory system which promises to provide a very flexible capability so that experiment changes will have a minimum impact on the station. F.R.L.

A70-43645 # **An evaluation of the 11,500-foot air ('alpine') atmosphere for a manned orbiting laboratory.** Thomas O. Nevison, Jr. (Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 312-316. 8 refs.

Consideration of the concept of using an 'alpine' air atmosphere (equivalent to 11,500 ft altitude) in a future manned orbiting laboratory. It is suggested that such an environment would reduce the risk from hypoxia, decompression sickness, accelerations, fire and blast, and possibly even cardiovascular deconditioning. One of the most serious spaceflight hazards, the risk of significant dysbarism during routine or emergency space suit operations, would be greatly reduced in an alpine environment because the partial pressure of nitrogen in the blood and tissue would be less than 2/3 of the sea level value. It is believed there would be little or no impairment in astronaut performance. F.R.L.

A70-43646 # **Cardiovascular adjustments observed in the Biosatellite III experiment.** John P. Meehan (Southern California, University, Los Angeles, Calif.). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 318-323. 5 refs.

Discussion of the results of the Biosatellite III experiment involving the orbital flight of a male macaca nemestrima monkey and lasting for a period of eight and a half days. The cardiac rate and vascular pressure data, as well as the water balance, weight loss, and brain temperature data recorded during the flight, are summarized and analyzed. O.H.

A70-43647 # **Possible alterations of the blood-brain and blood-cerebrospinal fluid barriers in space related environments.** Pietro Paoletti (Milano, Università, Milan, Italy). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 324-328.

Discussion of some medical subjects which could be investigated in a manned orbital laboratory. It is suggested to study the properties of blood-brain and blood-cerebrospinal fluid barriers under different physical environments. Another proposal is concerned with the study of cerebrospinal circulation and absorption while a third subject is to be the study of regional cerebral blood flow, with the isotope technique of injecting in the internal carotid artery Kr85 or Xe133, and recording the clearance curves of these isotopes in different parts of the brain. G.R.

A70-43648 # **Effects of weightlessness and immobilization on mechanical tolerance.** Henning von Gierke (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 333-338.

Discussion of tests in which startling changes in compressive strength and breaking strength of bones were found in Rhesus monkeys which had been kept for 60 days in an immobilized state. It is pointed out that the results obtained in these tests are an indication of what might happen to astronauts due to the effects of weightlessness. Therefore, it is felt that experiments should be conducted in an orbiting laboratory to obtain quantitative data regarding the effects of weightlessness on bone strength and mass. G.R.

A70-43651 * # **A summary of the medical experience in the Apollo program.** H. Russell Hair and Charles A. Berry (NASA, Manned Spacecraft Center, Houston, Tex.). In: International Academy of Astronautics, Orbital International Laboratory and Space Sciences Conference, Cloudcroft, N. Mex., September 28-October 2, 1969, Proceedings. (A70-43626 22-30) Edited by J. P. Stapp, H. J. von Beckh, J. N. Howard, and E. A. Steinhoff. Holloman AFB, N. Mex., AFMDC, Publishing Management Branch, 1970, p. 375-423. 8 refs.

Review of medical data provided by the first five manned missions of the Apollo program including the Apollo 11 landing mission. The topics discussed include spacecraft environment (cabin atmosphere, cabin and suit temperatures, noise and vibration, acceleration and impact), radiobiological and toxicological observations, weightlessness effects, food provisions, water and waste management, work/rest cycles, the medical kit and bioinstrumentation, preventive medication, and inflight disease. The contribution of Apollo program medical data to the knowledge of human response to space environment is assessed as considerable. V.Z.

A70-43690 **Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969.** Edited by D. E. Busby (Continental Air Lines, Inc., Los Angeles, Calif.). Dordrecht, D. Reidel Publishing Co., 1970. 361 p. $12.00. In English and French.

Contents:

Preface. D. E. Busby (Continental Air Lines, Inc., Los Angeles, Calif.), p. V.

Man in the exploration of space.

Summary of medical experience in the Apollo 7 through 11

manned spaceflights. C. A. Berry (NASA, Manned Spacecraft Center, Houston, Tex.), p. 3-41. (For abstract see issue 02, page 239, Accession no. A70-12669)

Physiological information monitoring techniques for the Soyuz spacecraft. L. I. Kakurin, I. S. Shadrintsev, and A. G. Zerenin (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR), p. 42-44. (See A70-43691 22-05)

Peculiarities of responses of the acoustic analyzer of man exposed to prolonged noise effects during a year-long medico-engineering experiment. T. N. Krupina, E. I. Matsnev, I. Ia. Iakovleva, M. A. Vytchikova, and V. Ia. Levanov (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR), p. 45-47. (For abstract see issue 24, page 4278, Accession no. A69-43408)

Exobiology. A. W. Schwartz (Nijmegen, Katholieke Universiteit, Nijmegen, Netherlands), p. 48-52. 10 refs. (See A70-43692 22-04)

Clinical aviation medicine.

Coronary risk factors and prevention. H. Blackburn (Minnesota, University, Minneapolis, Minn.), p. 55-67. 8 refs. (See A70-43693 22-04)

Cardiological examination and flying personnel - Its principal difficulties (Expertise cardiologique et personnel navigant - Ses principales difficultés). R. Carré, J. C. Richart, J. Salvagniac, and F. Plas (Ministère de l'Air, Paris, France), p. 68-74. 11 refs. (See A70-43694 22-05)

The Wolff-Parkinson-White syndrome and the fitness of flying personnel (Syndrome de Wolff-Parkinson et White et aptitude au personnel navigant). R. Carré, J. C. Richart, J. Salvagniac, and F. Plas (Ministère de l'Air, Paris, France), p. 75-79. 14 refs. (See A70-43695 22-04)

Norms for quantitative vectorcardiography with special emphasis on the medical evaluation of flying personnel. P. Rijlant, I. Ruttkay-Nedecky, J. Cernohorsky, and A. Allard (Bruxelles, Université Libre, Brussels, Belgium), p. 80-89. (For abstract see issue 24, page 4277, Accession no. A69-43390)

The diagnostics of early forms of atherosclerosis and latent coronary insufficiency in flight crews. B. L. Helam, I. M. Pitschugin, G. L. Strongin, L. I. Kuznetsova, and A. A. Shishova (Aeroflot, Moscow, USSR), p. 90-92. (See A70-43696 22-04)

Medical wastage of military and civil aircrew in Great Britain 1963-68. G. Bennett (Board of Trade, London, England) and P. J. O'Connor (RAF, Farnborough, Hants., England), p. 93-99. (For abstract see issue 24, page 4277, Accession no. A69-43391)

Air sickness in the French Air Force - Analytical study from 1961 to 1968 (Les malaises en vol dans l'armée de l'air francaise - Etude analytique de 1961 à 1968). P. Pesquies, P. M. Pingannaud, J. Nathie, and J. Bosarello (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Paris, France), p. 100-105. (For abstract see issue 24, page 4277, Accession no. A69-43383)

Selection of airline transport pilots - Psychiatric and psychological approach. H. Gartmann (Swissair AG, Zurich, Switzerland), p. 106-112. (See A70-43697 22-07)

Comments on ICAO recommendations concerning hearing requirements for flight personnel (A propos des recommandations de l'O.A.C.I. sur les normes auditives du personnel navigant technique). J. Pasquet and J. Lavernhe (Compagnie Nationale Air France, Paris, France), p. 113-115. (For abstract see issue 24, page 4277, Accession no. A69-43377)

A study of simulated airline pilot incapacitation. C. R. Harper, G. J. Kidera, and J. F. Cullen (United Air Lines, Inc., Denver, Colo.), p. 116-122. (For abstract see issue 24, page 4277, Accession no. A69-43386)

Prevention of food-borne diseases in civil aviation. J. Hoogendoorn and D. A. A. Mossel (KLM - Royal Dutch Airlines, Amsterdam, Netherlands), p. 123-125. (For abstract see issue 24, page 4278, Accession no. A69-43392)

Unscheduled landings for medical reasons - A five-year survey of the experience at American Airlines. V. Schocken and L. G. Lederer (American Airlines, Inc., New York, N.Y.), p. 126-129. (For abstract see issue 24, page 4278, Accession no. A69-43393)

U.S. aircraft hijackings - Epidemiological considerations. H. L. Reighard (FAA, Washington, D.C.), p. 130-134. (See A70-43698 22-05)

Experience with a physiologically-based formula for determining rest periods on long-distance air travel. L. E. Buley (International Civil Aviation Organization, Montreal, Canada), p. 135-141.

Hypnotics and jet-age travel. J. Snyder (Hoffman-La Roche, Inc., Nutley, N.J.), p. 142-145. (For abstract see issue 24, page 4277, Accession no. A69-43389)

Psychotherapy and chemotherapy in aviation medicine (Psychothérapies et chimiothérapies en médecine aéronautique). C. J. Blanc and R. J. Digo (Compagnie National Air France, Paris, France), p. 146-149. (For abstract see issue 24, page 4266, Accession no. A69-43378)

The role of radiology in medical investigations after ejection of military jet pilots (La part de la radiologie dans l'enquête médicale après éjection des pilotes militaires d'avions à réaction). R. P. Delahaye, G. Gueffier, H. Seris, and R. Auffret (Hôpital Dominique, Larrey, Versailles; Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France), p. 150-157. (For abstract see issue 24, page 4266, Accession no. A69-43379)

The centrifuge as a therapeutic device. R. Pelligra, S. Stein, J. Markham, P. Lippe, J. Noyes, J. Dickson, and K. Skrettingland (NASA, Ames Research Center, Moffett Field, Calif.), p. 158-168. (For abstract see issue 24, page 4265, Accession no. A69-43372)

Selective g-force application in the treatment of retinal detachment. J. Ten Doesschate, R. Hoppenbrouwers, and M. P. Lansberg (National Aeromedical Centre, Soesterberg, Netherlands), p. 169-173. (See A70-43699 22-04)

Man in his gaseous environment.

Decompression sickness in aviation. J. Ernsting (RAF, Farnborough, Hants., England), p. 177-187. (For abstract see issue 24, page 4269, Accession no. A69-43412)

Decompression sickness and the cardiovascular system. N. G. Meijne (Wilhelmina Hospital, Amsterdam, Netherlands), p. 188-197. 32 refs. (See A70-43700 22-04)

Factors influencing the time of safe unconsciousness (TSU) for commercial jet passengers following cabin decompression. J. G. Gaume (Douglas Aircraft Co., Long Beach, Calif.), p. 198-203. (For abstract see issue 24, page 4278, Accession no. A69-43398)

Gas exchange at low ambient pressure. M. E. Sluijter (Wilhelmina Hospital, Amsterdam, Netherlands), p. 204-207. (For abstract see issue 24, page 4269, Accession no. A69-43411)

Oxygen tolerances and adverse reactions. A. R. Behnke, p. 208-225. 40 refs. (See A70-43701 22-04)

Oscillations in expiratory gas flow during performance of forced vital capacity. D. H. Glaister (RAF, Farnborough, Hants., England), p. 226-232. 8 refs. (See A70-43702 22-05)

Man in his kinetic environment.

Dynamic cross-coupling in the semicircular canals. G. M. Jones (Defence Research Board; McGill University, Montreal, Canada), p. 235-248. 21 refs. (See A70-43703 22-05)

Interactions between semicircular canals and gravireceptors. A. J. Benson (RAF, Farnborough, Hants., England), p. 249-261. 25 refs. (See A70-43704 22-04)

The threshold value for stimulation of the horizontal semicircular canals. W. J. Oosterveld (Wilhelmina Hospital, Amsterdam, Netherlands), p. 262-268. (For abstract see issue 11, page 1992, Accession no. A70-26512)

Central regulation of vestibular function. J. J. Groen (Academic Hospital, Utrecht, Netherlands), p. 269-275. 11 refs. (See A70-43705 22-04)

Tracking performance during sinusoidal stimulation of the vertical and horizontal semicircular canals. F. E. Guedry, Jr. (U.S. Naval Aerospace Medical Institute, Pensacola, Fla.) and A. J. Benson (RAF, Farnborough, Hants., England), p. 276-288. 19 refs. (See A70-43706 22-04)

A new spatial disorientation test with some results concerning the role of the otoliths in the reorientation mechanism (Un nouveau test de désorientation spatiale avec quelques résultats concernant le

rôle des otolithes dans le mécanisme de réorientation). U. Brandt (Royal Swedish Air Force, Stockholm, Sweden), p. 289-300. (See A70-43707 22-04)

Importance of labyrinthine and other sensory information for normal driving. N. G. Henriksson and A. Nilsson (Lund, University, Lund, Sweden), p. 301-308. (See A70-43708 22-04)

Studies of effects of variations in the direction and magnitude of the gravitational-inertial force environment on the cardiovascular and respiratory systems. E. H. Wood (Mayo Clinic and Mayo Foundation, Rochester, Minn.), p. 309-314. 6 refs. (See A70-43709 22-04)

Effects of prolonged positive accelerations (+3G sub z) on the variations of human cardiac output (Effets des accélérations positives prolongées /+3G sub z/ sur les variations du débit cardiaque humain). J. M. R. Demange (Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France), p. 315-318. (For abstract see issue 24, page 4267, Accession no. A69-43385)

Human resistance to accelerations of high intensity and short duration - Mechanical and circulatory effects (Résistance du corps humain aux accélérations élevées de courte durée - Effets mécaniques et hémo-dynamiques). R. Auffret, H. Seris, J. Demange, and R. P. Delahaye (Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France), p. 319-322. (For abstract see issue 24, page 4266, Accession no. A69-43380)

The effect of supersonic flying on the urinary catecholamine excretion in pilots. R. Debijadji, L. Perović, and V. Varagić (Institute of Aviation Medicine, Zemun, Yugoslavia), p. 323-327. (For abstract see issue 24, page 4265, Accession no. A69-43370)

Man in his thermal environment.

Heat tolerance in the case of ventilation failure in a supersonic transport aircraft (Tolerance à la chaleur dans le cas de panne de la climatisation sur avion de transport supersonique). J. Colin, C. Boutelier, and J. Timbal (Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France), p. 331-336. (For abstract see issue 24, page 4277, Accession no. A69-43382)

Influence of altitude on human heat exchange (Influence de l'altitude sur les échanges thermiques de l'homme). J. Timbal, J. Colin, and C. Boutelier (Centre d'Essais en Vol, Brétigny-sur-Orge, Essonne, France), p. 337-339. (For abstract see issue 24, page 4267, Accession no. A69-43384)

Man in his temporal environment.

Circadian periodicity of reaction-times. J. C. Aschoff, G. Giedke, and H. Pöppel (Ulm, Universität, Ulm; Max-Planck-Institut für Verhältensforschung, Erling-Andechs, West Germany), p. 343-347. (For abstract see issue 24, page 4267, Accession no. A69-43387)

Circadian rhythm and performance. M. Van Zoeren, L. Pannekoek, and T. H. H. Thijssen (National Aeromedical Centre, Soesterberg, Netherlands), p. 348-352. (For abstract see issue 24, page 4268, Accession no. A69-43407)

The urinary excretion of hormonal metabolites before, during and after intercontinental flights. T. Strengers (O.L. Vrouwe Hospital; KLM - Royal Dutch Airlines, Amsterdam, Netherlands), p. 353-355. (For abstract see issue 24, page 4268, Accession no. A69-43404)

Methods for the study of the behaviour of human circadian rhythms in kidney function before, during and after global flights. F. Gerritzen (O.L. Vrouwe Hospital; KLM - Royal Dutch Airlines, Amsterdam, Netherlands), p. 356-358. (For abstract see issue 24, page 4266, Accession no. A69-43374)

A70-43691 Physiological information monitoring techniques for the Soyuz spacecraft. L. I. Kakurin, I. S. Shadrintsev, and A. G. Zerenin (Akademiia Meditsinskikh Nauk SSSR, Moscow, USSR). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 42-44.

Description of the physiological equipment and techniques which provided an adequate monitoring of cardiovascular and respiratory activities and body temperature of the astronauts in the Soyuz spacecraft. Difficulties regarding the acquisition of biomedical information from astronauts in space missions are examined. It is shown how these difficulties were overcome in the medical control system designed for the Soyuz spacecraft. G.R.

A70-43692 Exobiology. A. W. Schwartz (Nijmegen, Katholieke Universiteit, Nijmegen, Netherlands). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 48-52. 10 refs.

Discussion of the possibilities for the development and the evolution of life on other planets of the solar system. The basic conditions for the origin of life on a planet in connection with a primordial atmosphere are examined, and the conditions presented by the planets of the solar system are considered. It is concluded that Mars remains as the only other body in the solar system on which life may have had a good opportunity to evolve. Studies with simulated Martian environments have demonstrated that common terrestrial microorganisms can survive and even grow under such conditions. It is thought that the accelerated growth of organisms produced by the yearly arrival of water vapor could be responsible for the observed darkening of certain areas on the Martian surface. G.R.

A70-43693 Coronary risk factors and prevention. H. Blackburn (Minnesota, University, Minneapolis, Minn.). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 55-67. 8 refs. PHS Grant No. HE-06314.

Discussion of a preventive approach to reduce the overall coronary heart disease (CHD) problem by taking into consideration the factors associated with an increased occurrence of CHD. It is found that simple measurement of traits such as blood pressure, blood cholesterol, body weight, and the cigarette smoking habit allows separation of men into classes with vastly different CHD risk probabilities, with risk differences on the order from 4 to 13 times. Constructive guide lines to CHD risk and coronary prevention are discussed. The grounding of flight personnel with excessive CHD risk according to the risk factors is recommended. G.R.

A70-43694 Cardiological examination and flying personnel - Its principal difficulties (Expertise cardiologique et personnel navigant - Ses principales difficultés). R. Carré, J. C. Richart, J. Salvagniac, and F. Plas (Ministère de l'Air, Centre Principal d'Expertise Médicale du Personnel Navigant, Paris, France). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 68-74. 11

refs. In French.

Discussion of difficulties regarding the cardiological examination of flying personnel taking into consideration electrocardiographical anomalies and the study of the elasticity of the artery wall. Practical tests involving subjects with electrocardiographical anomalies of indeterminate etiology are discussed. Difficulties in the interpretation of systolic souffles are examined giving particular attention to those aspects of systolic souffles which constitute a problem for the specialist in aeronautical medicine. G.R.

A70-43695 The Wolff-Parkinson-White syndrome and the fitness of flying personnel (Syndrome de Wolff-Parkinson et White et aptitude au personnel navigant). R. Carré, J. C. Richart, J. Salvagniac, and F. Plas (Ministère de l'Air, Centre Principal d'Expertise Médicale du Personnel Navigant, Paris, France). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 75-79. 14 refs. In French.

Discussion of the characteristics of the Wolff-Parkinson-White (WPW) syndrome, its occurrence, and its significance regarding the fitness of flying personnel. The characteristic electrical indications of the WPW syndrome are briefly considered. Two principal types of the syndrome are described. The frequency of the occurrence of the syndrome is considered. It is pointed out that persons suffering from this electrocardiographic anomaly are not permitted in France to become members of the flying personnel of aircraft. G.R.

A70-43696 The diagnostics of early forms of atherosclerosis and latent coronary insufficiency in flight crews. B. L. Helam, I. M. Pitschugin, G. L. Strongin, L. I. Kuznetsova, and A. A. Shishova (Aeroflot, Moscow, USSR). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 90-92.

Study of diagnostic techniques for identifying atherosclerotic disease of the aorta and the coronary arteries taking into consideration medical examinations involving 244 flight crew members suspected of having atherosclerosis. It was found that elevated concentrations of serum betalipoproteins are the best indicator of atherosclerosis of all the biochemical blood tests of lipid metabolism performed. Other tests discussed include radiographic studies, ECG, the glucose test and an analysis of the heart's systolic phase. G.R.

A70-43697 Selection of airline transport pilots - Psychiatric and psychological approach. H. Gartmann (Swissair AG, Zurich, Switzerland). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 106-112.

Discussion of the methods used by Swissair for selecting airline transport pilots. The situation in 1968 is described. A total of 528 young candidates were screened in a one day preselection program; 72 of them were considered suitable enough to be admitted to a two-week selection flying course. During this course 36 were eliminated. The remaining 36 were admitted to the main selection. Twenty of them were successful. The tests conducted include a Rorschach-test and psychomotor tests focused mainly on multiple attention under stress. G.R.

A70-43698 U.S. aircraft hijackings - Epidemiological considerations. H. L. Reighard (FAA, Office of Aviation Medicine, Washington, D.C.). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 130-134.

Study of the epidemiological aspects of aircraft hijacking involving the collection and recording of available information concerning hijacking events and the persons who had committed this crime. The purpose of the investigation is to describe the phenomenon and the involved persons in a way intended to lead eventually to preventive methods. The descriptive and analytical phases of the study involved the processing of data obtained from reports of investigations of the behavioral backgrounds of hijackers, aircrew reports regarding hijackers, data on airlines, aircraft and airports affected and certain classified information. G.R.

A70-43699 Selective g-force application in the treatment of retinal detachment. J. Ten Doesschate, R. Hoppenbrouwers, and M. P. Lansberg (National Aeromedical Centre, Soesterberg, Netherlands). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 169-173.

Discussion of a technique for treating cases of retinal detachment by the application of g-force making use of a centrifuge. The positioning of the patient on the centrifuge is discussed, and case reports of clinical trials involving the use of the centrifuge are considered. It is concluded that the application of centrifugal force to a detached retina appears to have some virtue in special instances, but that there is no reason for exaggerated optimism. G.R.

A70-43700 Decompression sickness and the cardiovascular system. N. G. Meijne (Wilhelmina Hospital, Amsterdam, Netherlands). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 188-197. 32 refs.

Discussion of various pathophysiological aspects of decompression sickness giving particular attention to the role of the cardiovascular system in the production of this phenomenon. The pathogenesis of decompression sickness is considered. The role of the cardiovascular system in decompression sickness is examined taking into account the impairment of tissue perfusion by bubbles, the obstruction of the pulmonary circulation by emboli, and the role of hypoxia. The altitude at which decompression sickness is likely to occur is discussed. It is expected that probably more cases of decompression sickness in aircraft will occur in the future because of higher levels in air traffic. The therapeutic measures of importance in cases of decompression sickness are considered, and preventive steps are discussed. G.R.

A70-43701 Oxygen tolerances and adverse reactions. A. R. Behnke. In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 208-225. 40 refs.

Review of the experience derived from exposure of man and animals to inhalation of O2 at higher pressures. Following a survey of earlier data (1932-1935) resulting from hyperbaric investigations on animals and man, hyperbaric O2 tests of major importance, carried out during and following World War II, are described and discussed. The various factors that influence the variability of response to

hyperbaric O2, such as the role of CO2, influence of hormones, and modification of O2 toxicity by surgical intervention, are then examined. Responses of visual cell population to increased O2 pressure are also considered. Finally, the etiology of O2 poisoning is discussed. O.H.

A70-43702 Oscillations in expiratory gas flow during performance of forced vital capacity. D. H. Glaister (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 226-232. 8 refs.

Study of oscillations in expiratory gas flow during performance of forced vital capacity maneuvers using an Electro/Med Model 780 waterless spirometer. For recordings of forced vital capacity, the subject inspired maximally and then expired maximally and as forcibly as possible into the spirometer. Expiratory flow-volume curves obtained during forced vital capacities with subject breathing air at atmospheric pressure, air at elevated pressure, and sulphur hexafluoride, are presented and discussed. The observation of oscillation in air flow is shown to support the concept that airways may behave like Starling resistors and become unstable during expiration. When a dense gas is breathed, the pressure drop along the airways increases and the point at which collapse will tend to occur will move upstream. O.H.

A70-43703 Dynamic cross-coupling in the semicircular canals. G. Melvill Jones (Defence Research Board, Aviation Medical Research Unit; McGill University, Montreal, Canada). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 235-248. 21 refs.

Investigation of the functional nature of adverse dynamic cross-coupled responses of the semicircular canals to rotational movement. The response of a simplified mechanical model comprising only one circular canal and without introduction of forces due to cupular elasticity is first examined - i.e., considering the fluid displacement in a circular tube which has no transducing cupular system interfering with the flow pattern of response. The actual response of the whole biological system in terms of fidelity of neural response, influence of optokinetic fixation, and additional complicating factors is then considered, and the feasibility of predicting it by mechanical model response is discussed. Finally, methods for ameliorating the complex effects of dynamic cross-coupling of the canals are presented. O.H.

A70-43704 Interactions between semicircular canals and gravireceptors. A. J. Benson (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 249-261. 25 refs.

Discussion of the interaction of semicircular canals and otoliths, drawing examples from two types of experiments: those in which canal and gravireceptor signals are antagonistic, and those in which the information from these receptors is synergistic. It would appear that gravireceptor inhibition increases in intensity as an exponential function of time. The time constant of this function is dependent upon the intensity of signals from otoliths and other gravireceptors, and upon their significance in relationship to concurrent signals from ampullary recerptors. As gravireceptor inhibition is associated with a reduction in the magnitude of a secondary postrotatory nystagmus, it is considered that the attenuation of the canal response is more likely to be brought about by recurrent inhibitory connections than by an augmentation of the adaptive mechanism which is considered to be responsible for the secondary response. M.M.

A70-43705 Central regulation of vestibular function. J. J. Groen (Academic Hospital, Utrecht, Netherlands). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 269-275. 11 refs.

Discussion of the mechanisms involved in the regulation of the flow of vestibular messages by the central nervous system. The normal overall function of the vestibular system can be considered as the result of at least three interdependent activities: (1) afference generated in the peripheral organ by mechanical stimulation of the hair cells which activate the afferent neurons; (2) inhibition of the afference by efference generated in the central nervous system, to a degree depending on the afference; the efference is transmitted along the Rasmussen bundle, terminating upon the hair cells of the peripheral organ, so reducing the transfer function between hair cell and neuron; and (3) pattern center activity generated in the central nervous system when labyrinthine stimulation has a repetitive character. M.M.

A70-43706 * Tracking performance during sinusoidal stimulation of the vertical and horizontal semicircular canals. F. E. Guedry, Jr. (U.S. Naval Aerospace Medical Institute, Pensacola, Fla.) and A. J. Benson (RAF, Institute of Aviation Medicine, Farnborough, Hants., England). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 276-288. 19 refs. Army-NASA-supported research.

Experimental investigation of the effect of vestibular stimulation on an extrapolation of the instrument flying task - i.e., compensatory tracking during various conditions of display luminance. To obtain a better understanding of the perceptual and reflex responses to vestibular stimulation in flight, visual tracking performance tests were performed in which the stimulus to the semicircular canals was a sinusoidal oscillation about an earth-vertical axis with a period of 25 sec, while the subject was positioned either upright, rotating about his z-axis, or left side down, rotating about his y-axis. In these experiments, two kinds of directional effects were noted in regard to vestibular reactions. One was the difference between nystagmus up and nystagmus down with stimuli of equal magnitude but opposite directions about the man's y-axis. The other was the difference between horizontal nystagmus and vertical nystagmus produced by stimuli about the z- and y-axes, respectively. The differences in response to vertical and horizontal canal stimulation observed are discussed and analyzed, and some speculations about functional aspects of these responses are considered. O.H.

A70-43707 A new spatial disorientation test with some results concerning the role of the otoliths in the reorientation mechanism (Un nouveau test de désorientation spatiale avec quelques résultats concernant le rôle des otolithes dans le mécanisme de réorientation). U. Brandt (Royal Swedish Air Force, Medical Dept., Stockholm, Sweden). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 289-300. In French.

Experimental study involving the testing of human subjects in a centrifuge to ascertain the possibility of distinguishing otolithic signals. An attempt is made to elicit simultaneously the two

responses of counterrotation of the ocular globe and change of position of the eye in space. The possibility that the eye shows compensatory rectifications not only about the visual axis, but also about the other two axes is considered. It is concluded that under the experimental conditions (complete darkness, linear accelerations of variable direction and magnitude, subliminal angular component) the behavior of the eye appears to show a sensory mechanism at the otolith level. A.B.K.

A70-43708 Importance of labyrinthine and other sensory information for normal driving. N. G. Henriksson and A. Nilsson (Lund, University, Lund, Sweden). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 301-308.

Study of the influence of variations in peripheral sensory information on normal driving. To investigate this problem, the following consecutive steps were carried out: an analysis was made of the driver as a receptor of physical impulses; a car simulator was designed and constructed; driving students were tested in the car simulator; normal subjects were tested when exposed to combinations of impaired visual, vestibular, and proprioceptive inputs; driving ability was studied as a function of age; and the driving ability of patients with various lesions of the vestibular system was assessed. The results indicate that extensive loss or defects in information provided by any one of the visual, vestibular, and proprioceptive systems do not produce a pronounced loss in driving ability in a car simulator. When exposed to both postrotatory stimulation and reduced visual inputs, driving ability is markedly reduced. Patients with vestibular disorders, even after acute labyrinthectomy, do not show a significant loss of driving ability. Individuals who suffer acute attacks of vertigo should be advised not to drive in darkness. O.H.

A70-43709 * Studies of effects of variations in the direction and magnitude of the gravitational-inertial force environment on the cardiovascular and respiratory systems. E. H. Wood (Mayo Clinic and Mayo Foundation, Rochester, Minn.). In: Recent advances in aerospace medicine; Proceedings of the Eighteenth International Congress of Aviation and Space Medicine, Amsterdam, Netherlands, September 15-18, 1969. (A70-43690 22-04) Edited by D. E. Busby. Dordrecht, D. Reidel Publishing Co., 1970, p. 309-314. 6 refs. Research supported by the American Heart Association; NIH Grant No. H-3532; Contract No. AF 41(609)-68-C-0022; Grant No. NsG-327.

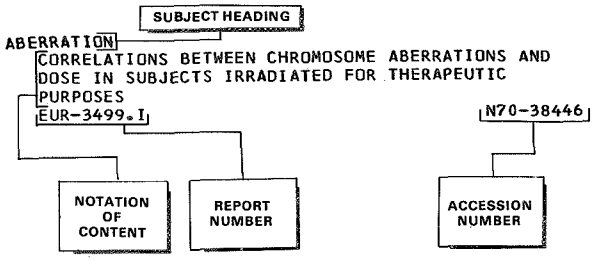
Description of simplified computer programs developed for processing and analyzing data on intervascular and respiratory pressures and other variables in man, chimpanzees and dogs, continuously recorded on paper photokymographs and magnetic tape during changes in the force environment produced on a centrifuge. With the use of these programs, a continuous analog type recording can be produced from the original digital tape, with all pressure corrections applied, and a continuous photokymographic record made of all the computer-corrected variables. In effect, use of the computer in this manner converts the photokymographic recording assembly into a multichannel, very high-speed x-y plotter. O.H.

A70-43732 Pattern recognition approach to medical diagnosis. Casimir A. Kulikowski (Hawaii, University, Honolulu, Hawaii). *IEEE Transactions on Systems Science and Cybernetics,* vol. SSC-6, July 1970, p. 173-178. 10 refs. Contract No. AF 44(620)-69-C-0030; Grant No. AF AFOSR 68-1466B.

A sequential method of pattern recognition was used to recognize hyperthyroidism in a sample of 2208 patients being treated at the Straub Clinic in Honolulu, Hawaii. For this, the method of class featuring information compression (CLAFIC) was used, introducing some significant improvements in computer medical diagnosis, which by its very nature is a pattern recognition problem. A unique subspace characterizes each class at every decision stage, and the most prominent class features are selected. Thus the symptoms which best distinguish hyperthyroidism are extracted at every step and the number of tests required to reach a diagnosis is reduced. (Author)

Subject Index

Typical Subject Index Listing



The Notation of Content (NOC), rather than the title of the document, is used to provide a more exact description of the subject matter. The NASA or AIAA accession number is included in each entry to assist the user in locating the abstract in the abstract section of this supplement. If applicable, a report number is also included as an aid in identifying the document.

A

B

C

D

E

F

G

H

K

L

M

N

O

P

R

S

T

U

V

W

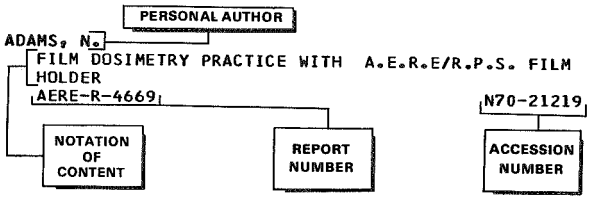
X

Y

Z

Personal Author Index

Typical Personal Author Index Listing



The Notation of Content (NOC), rather than the title of the document, is used to provide a more exact description of the subject matter. The NASA or AIAA accession number is included in each entry to assist the user in locating the abstract in the abstract section of this supplement. If applicable, a report number is also included as an aid in identifying the document.

A

B

C

D

E

F

G

H

L

M

N

O

P

Q

R

S

T

U

V

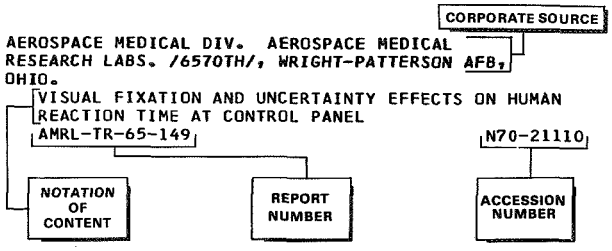
W

Y

Z

Corporate Source Index

Typical Corporate Source Index Listing



The Notation of Content (NOC), rather than the title of the document, is used to provide a more exact description of the subject matter. The NASA or AIAA accession number is included in each entry to assist the user in locating the abstract in the abstract section of this supplement. If applicable, a report number is also included as an aid in identifying the document.

A

ADAPTRONICS, INC., MCLEAN, VA.
Theory of neuromine network systems
[AD-706855] N70-38302

ADDIS TRANSLATIONS INTERNATIONAL, WOODSIDE, CALIF.
Chromosomal abnormalities in leukocytes in persons working under conditions of exposure to ionizing radiation
[UCRL-TRANS-10442] N70-39329

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, PARIS /FRANCE/.
Respiratory and cardiographic measurement methods on mixed venous gas tension in humans
[AGARD-AG-143-70-PT-2] N70-38530
Cardiorespiratory function analysis by gas tension measurements in mixed venous blood of humans
[AGARD-AG-143-70-PT-1] N70-38531

AEROSPACE MEDICAL DIV. AEROMEDICAL RESEARCH LAB. /6571ST/, HOLLOMAN AFB, N. MEX.
Protective measures against accidental decompression in space and atmospheric flight
[AD-705563] N70-38693

AEROSPACE MEDICAL RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.
Dimensional requirements of pressure suited man in man machine systems
[AD-706888] N70-37714
Anthropology of anthropomorphic dummies for use in vehicle crash tests
[AD-706411] N70-38473
Human performance in speed and accuracy of leg and foot motions in pedal control operations
[AD-707142] N70-38873
Toxicological screening of spacecraft materials exposed to space cabin atmospheres
[AMRL-TR-69-53] N70-39280

AIR FORCE SYSTEMS COMMAND, BROOKS AFB, TEX.
Innovations in Air Force technical and flying training
[AD-707511] N70-37680

AIR FORCE SYSTEMS COMMAND, WRIGHT- PATTERSON AFB, OHIO.
Feasibility study of foam-in-place form fitting helmet liners for flight crew use
[AD-706402] N70-37615

ARIZONA STATE DEPT. OF HEALTH, PHOENIX.
Evaluation of Arizona air pollution control laws N70-39321

ARIZONA UNIV., TUCSON.
Air pollution control seminar, including data on automobiles, copper smelting, human health, laws, meteorological factors, and effects on astronomy
[REPT-6-70-28-600] N70-39313
Air pollution effects on human health N70-39316

ARMY BEHAVIOR AND SYSTEMS RESEARCH LAB., ARLINGTON, VA.
Maintaining target detection proficiency through team consensus feedback and photointerpretation
[AD-707376] N70-40247

ARMY BEHAVIORAL SCIENCE RESEARCH LAB., ARLINGTON, VA.
Comparison of computer-simulated conventional and branching tests
[AD-707375] N70-37685

ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER, WASHINGTON, D. C.
Men and machine interactions in control systems
[AD-706544] N70-38917

ARMY NATICK LABS., MASS.
Freeze-dried food products for armed services, including application to space flight feeding
[AD-706900] N70-37722
Semi-solid, dehydrated, rehydratable, thermally stabilized wet, and intermediate moisture food development for space flights N70-39281

B

BATTELLE MEMORIAL INST., RICHLAND, WASH.
Deep submergence diving physiology and decompression studies using swine, swine evaluation as hyperbaric analog to man, and embolism detection with Doppler flowmeter
[AD-708748] N70-40150

BOLT, BERANEK, AND NEWMAN, INC., CAMBRIDGE, MASS.
Computer program for student instruction and response dialogue
[AD-707782] N70-40095

BUREAU OF MINES, PITTSBURGH, PA.
Vapor leakage test on chemical cartridge respirator face mask
[BM-RI-7431] N70-38527

C

CALIFORNIA UNIV., BERKELEY.
Historic and scientific consideration of organic geochemical research on origin of life N70-39248

CALIFORNIA UNIV., BERKELEY. LAWRENCE RADIATION LAB.
Dynamic analysis of lungs and heart using krypton-81m and scintillation camera
[UCRL-19785] N70-39191

CALIFORNIA UNIV., LA JOLLA.
Photographic and current measurements of deep circulation and fish populations in Pacific Ocean
[UCSD-34-P-127-7] N70-39672

CALIFORNIA UNIV., LIVERMORE. LAWRENCE RADIATION LAB.
Chromosomal abnormalities in leukocytes in persons working under conditions of exposure to ionizing radiation
[UCRL-TRANS-10442] N70-39329

CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO.
Visual perception by human eye related to abnormalities in radiographs
[COO-78-225] N70-39358

CENTRAL RESEARCH INST. FOR PHYSICS, BUDAPEST /HUNGARY/.
Solid particles from zirconium-tritium aerosols for neutron production
[KFKI-70-9] N70-39804

CITY COLL. OF THE CITY OF NEW YORK.
Criteria for evaluating image enchancement techniques with emphasis on human visual

D

E

F

G

H

I

J

K

L

M

N

O

P

R

S

T

U

V

W

PUBLIC COLLECTIONS OF NASA DOCUMENTS

DOMESTIC

NASA deposits its technical documents and bibliographic tools in eleven Federal Regional Technical Report Centers located in the organizations listed below. Each center is prepared to furnish the public such services as reference assistance, interlibrary loans, photocopy service, and assistance in obtaining copies of NASA documents for retention.

CALIFORNIA
University of California, Berkeley

COLORADO
University of Colorado, Boulder

DISTRICT OF COLUMBIA
Library of Congress

GEORGIA
Georgia Institute of Technology, Atlanta

ILLINOIS
The John Crerar Library, Chicago

MASSACHUSETTS
Massachusetts Institute of Technology, Cambridge

MISSOURI
Linda Hall Library, Kansas City

NEW YORK
Columbia University, New York

PENNSYLVANIA
Carnegie Library of Pittsburgh

TEXAS
Southern Methodist University, Dallas

WASHINGTON
University of Washington, Seattle

NASA publications (those indicated by an "*" following the accession number) are also received by the following public and free libraries:

CALIFORNIA
Los Angeles Public Library
San Diego Public Library

COLORADO
Denver Public Library

CONNECTICUT
Hartford Public Library

DELAWARE
Wilmington Institute Free Library, Wilmington

MARYLAND
Enoch Pratt Free Library, Baltimore

MASSACHUSETTS
Boston Public Library

MICHIGAN
Detroit Public Library

MINNESOTA
Minneapolis Public Library
James Jerome Hill Reference Library, St. Paul

MISSOURI
Kansas City Public Library
St. Louis Public Library

NEW JERSEY
Trenton Public Library

NEW YORK
Brooklyn Public Library
Buffalo and Erie County Public Library
Rochester Public Library
New York Public Library

OHIO
Akron Public Library
Cincinnati Public Library
Cleveland Public Library
Dayton Public Library
Toledo Public Library

OKLAHOMA
Oklahoma County Libraries, Oklahoma City

TENNESSEE
Cossitt-Goodwin Libraries, Memphis

TEXAS
Dallas Public Library
Fort Worth Public Library

WASHINGTON
Seattle Public Library

WISCONSIN
Milwaukee Public Library

An extensive collection of NASA and NASA-sponsored documents and aerospace publications available to the public for reference purposes is maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 750 Third Avenue, New York, New York, 10017.

EUROPEAN

An extensive collection of NASA and NASA-sponsored publications is maintained by the National Lending Library for Science and Technology, Boston Spa, Yorkshire, England. By virtue of arrangements other than with NASA, the National Lending Library also has available many of the non-NASA publications cited in *STAR*. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols "#" and "*", from: ESRO/ELDO Space Documentation Service, European Space Research Organization, 114, av de Neuilly, 92-Neuilly-sur-Seine, France.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D. C. 20546

OFFICIAL BUSINESS

FIRST CLASS MAIL

POSTAGE AND FEES PAID
NATIONAL AERONAUTICS ANI
SPACE ADMINISTRATION

POSTMASTER: If Undeliverable (Section 158 Postal Manual) Do Not Return

"The aeronautical and space activities of the United States shall be conducted so as to contribute . . . to the expansion of human knowledge of phenomena in the atmosphere and space. The Administration shall provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

—NATIONAL AERONAUTICS AND SPACE ACT OF 1958

NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS

TECHNICAL REPORTS: Scientific and technical information considered important, complete, and a lasting contribution to existing knowledge.

TECHNICAL NOTES: Information less broad in scope but nevertheless of importance as a contribution to existing knowledge.

TECHNICAL MEMORANDUMS: Information receiving limited distribution because of preliminary data, security classification, or other reasons.

CONTRACTOR REPORTS: Scientific and technical information generated under a NASA contract or grant and considered an important contribution to existing knowledge.

TECHNICAL TRANSLATIONS: Information published in a foreign language considered to merit NASA distribution in English.

SPECIAL PUBLICATIONS: Information derived from or of value to NASA activities. Publications include conference proceedings, monographs, data compilations, handbooks, sourcebooks, and special bibliographies.

TECHNOLOGY UTILIZATION PUBLICATIONS: Information on technology used by NASA that may be of particular interest in commercial and other non-aerospace applications. Publications include Tech Briefs, Technology Utilization Reports and Technology Surveys.

Details on the availability of these publications may be obtained from:

SCIENTIFIC AND TECHNICAL INFORMATION OFFICE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Washington, D.C. 20546